



... for a brighter future

Summary of IEX Device Simulation

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Joint AOP and MD meeting

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U.S. Department
of Energy



A U.S. Department of Energy laboratory
managed by The University of Chicago

Definitions

■ Lattice

- APS – APS lattice without any insertion devices
- CPU – APS + CPU
 - $0.128 \times 38 = 4.864 \text{ m}$ (*mistake*)
- IEX1 – APS + IEX (first design – large roll off)
 - $0.12 \times 40 = 4.8 \text{ m}$
- IEX2 – APS + IEX (second design – smaller roll off)
 - $0.125 \times 38 = 4.75 \text{ m}$
- IEX3 – APS + IEX (modified of second design – slightly large roll off of Bx field)
 - $0.125 \times 38 = 4.75 \text{ m}$

■ Mode

- Pure By field – H mode.
- Pure Bx field – V mode.
- Bx + By field – C mode (AC by mistake)

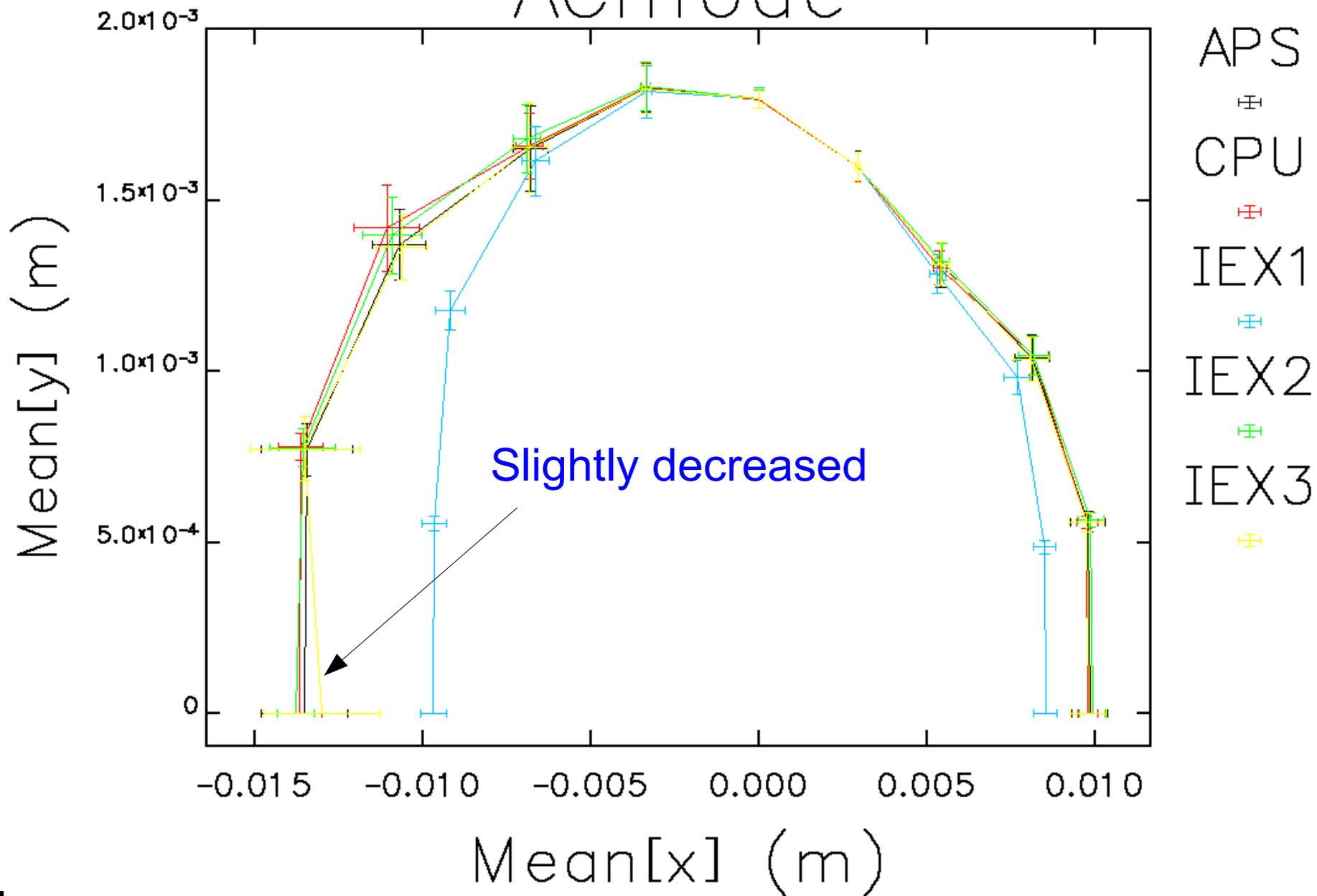
■ Aperture

- Transverse aperture (DA) – contribution to injection efficiency.
- Longitudinal aperture (MA) – contribution to lifetime.

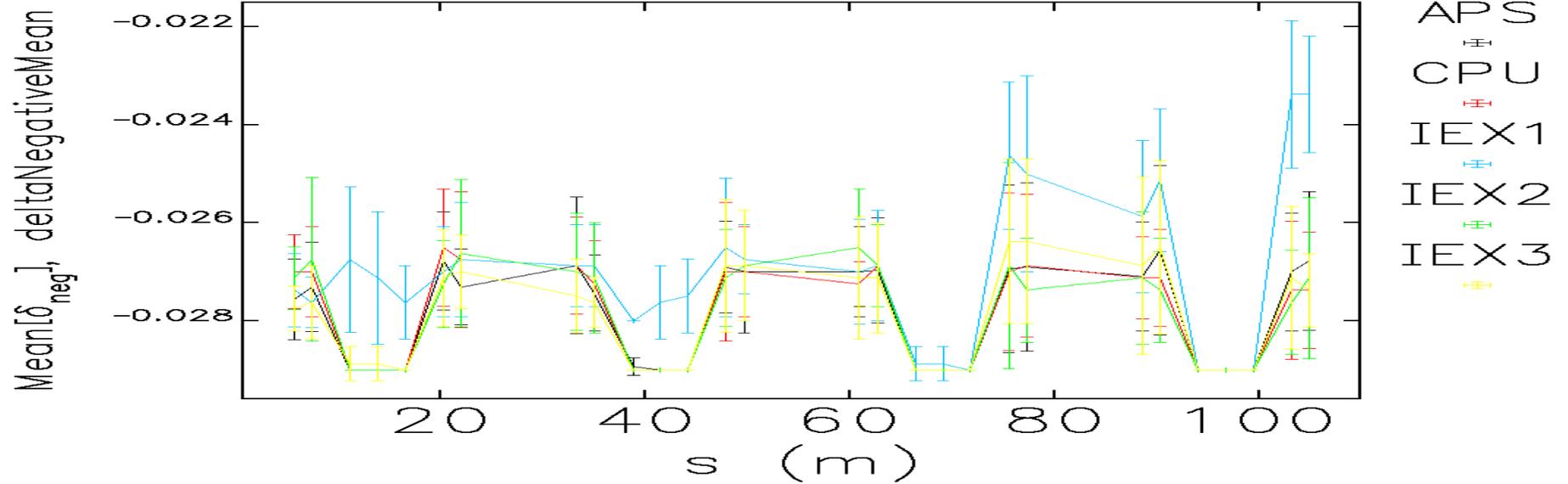
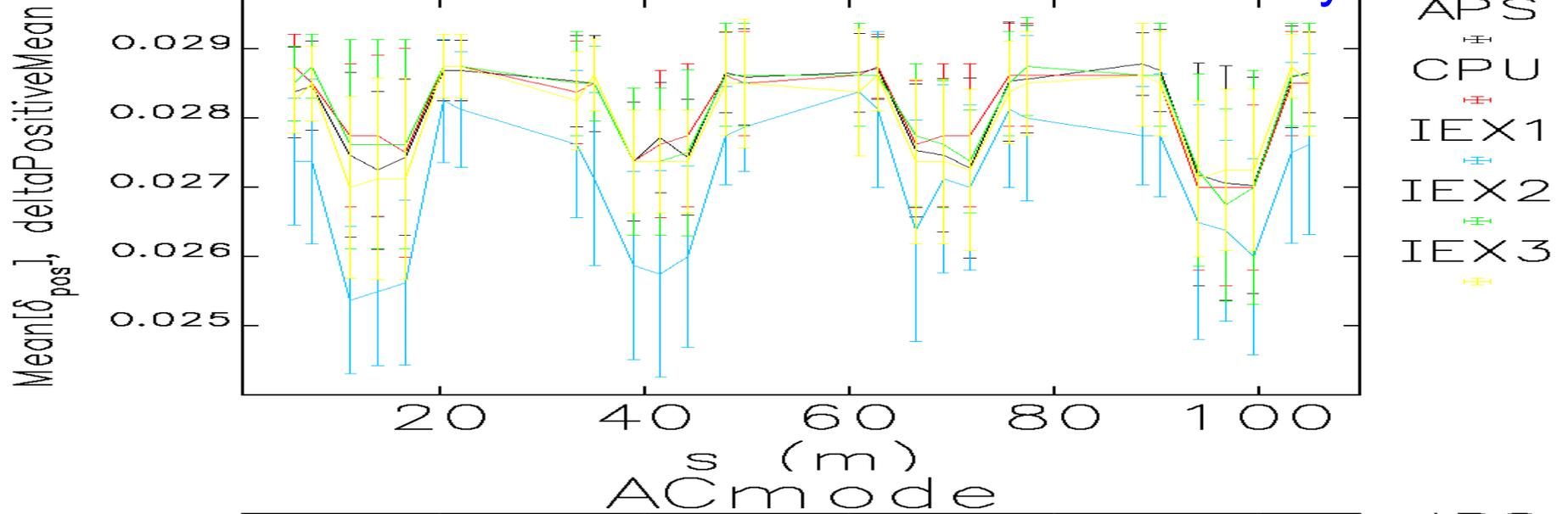
■ Kickmap

- $\text{Int (BL)} = \text{kick (x' or y')} \times 23.3 \text{ (T. m)}$

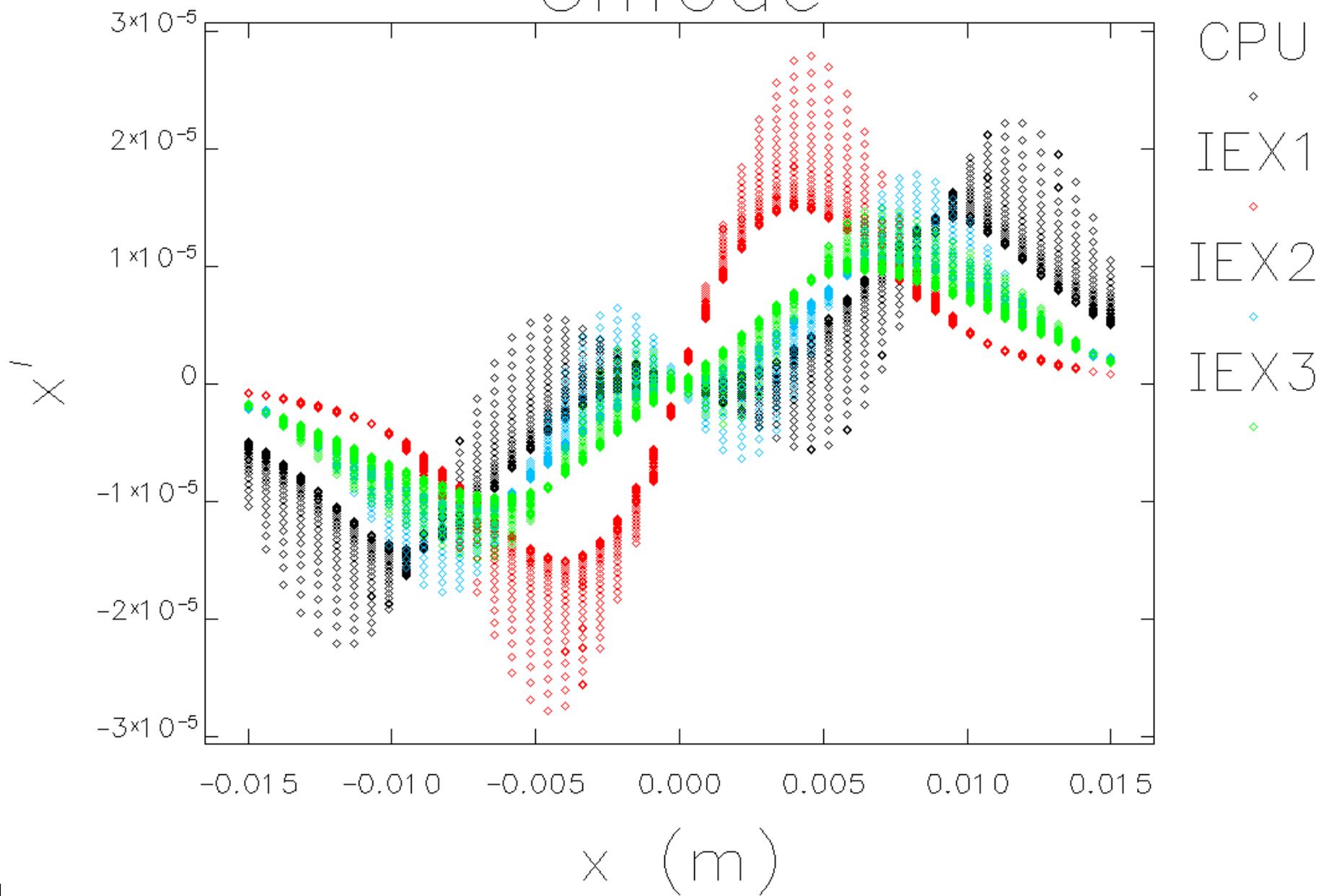
ACmode



ACmode No obviously difference

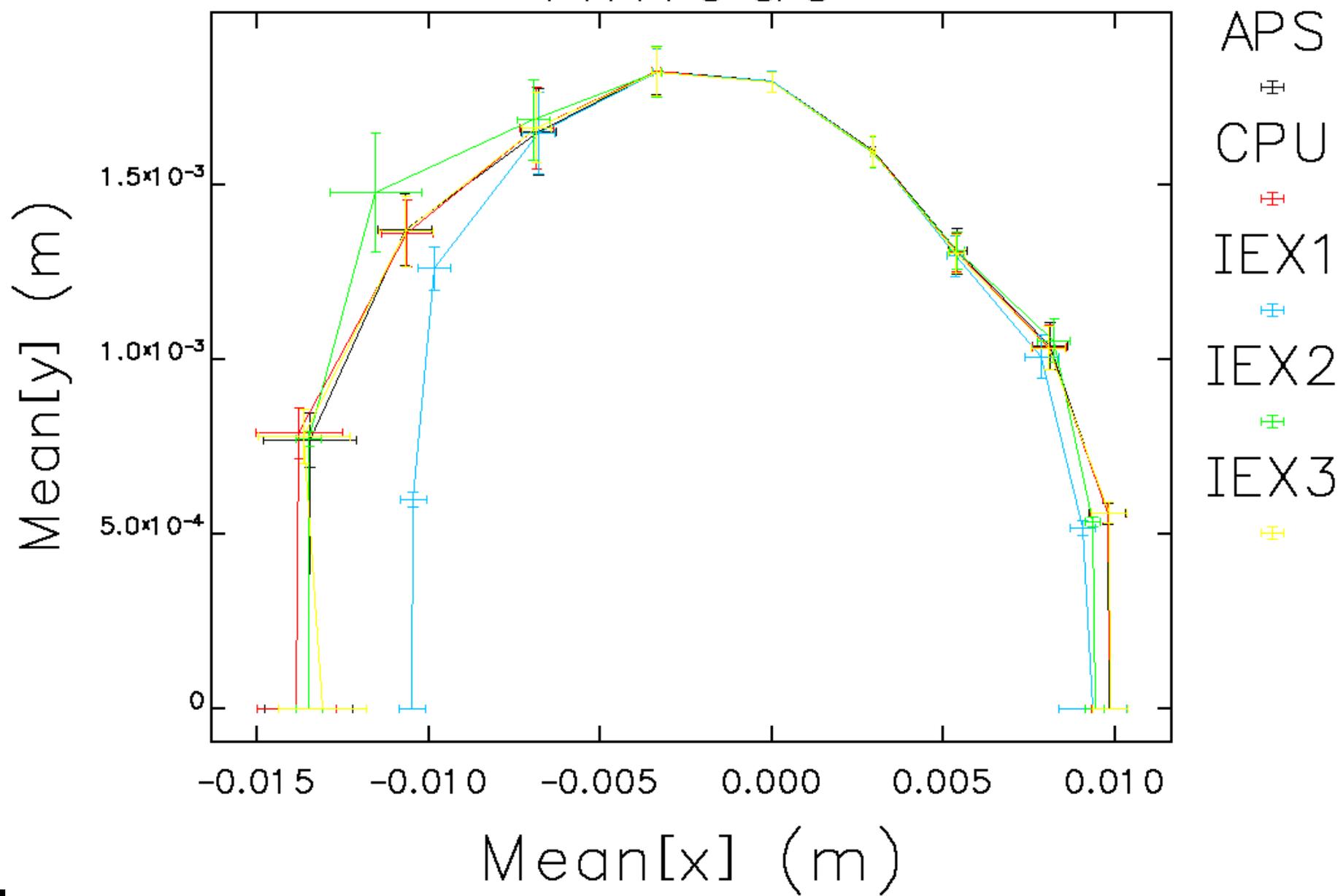


Cmode

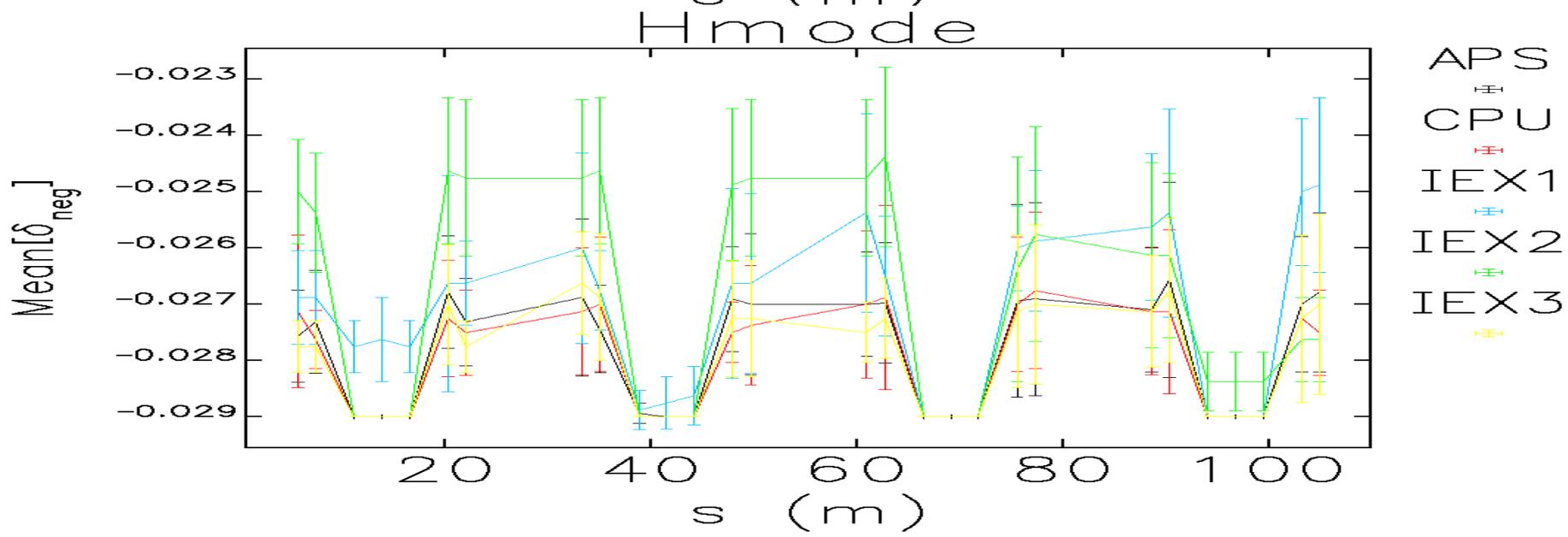
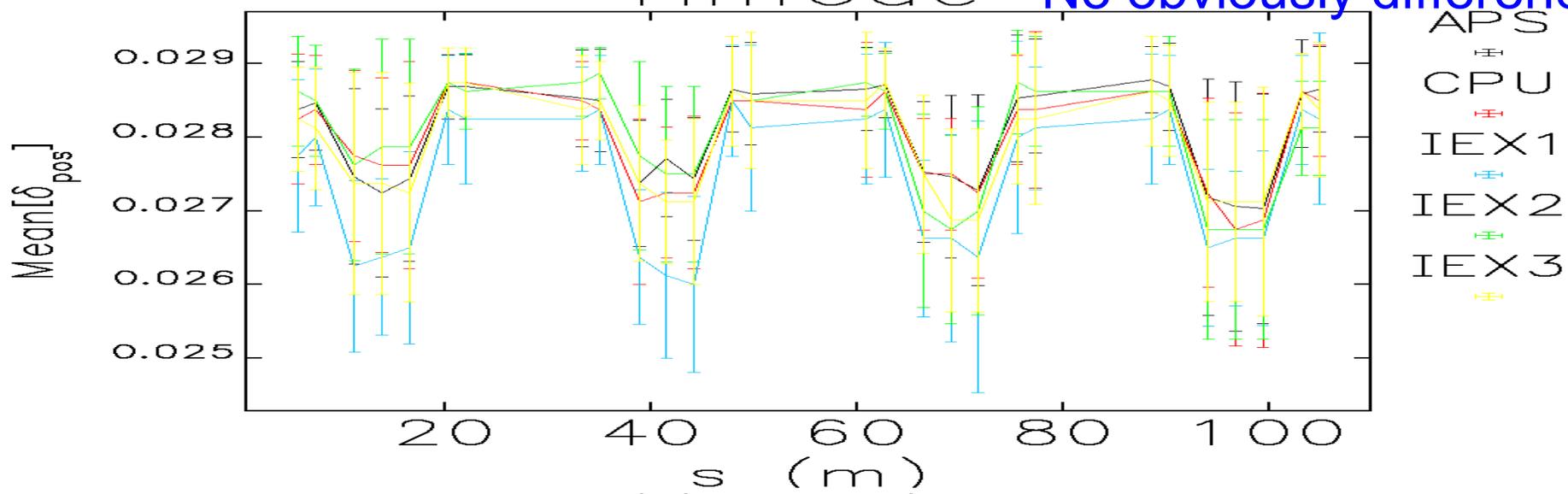


Hmode

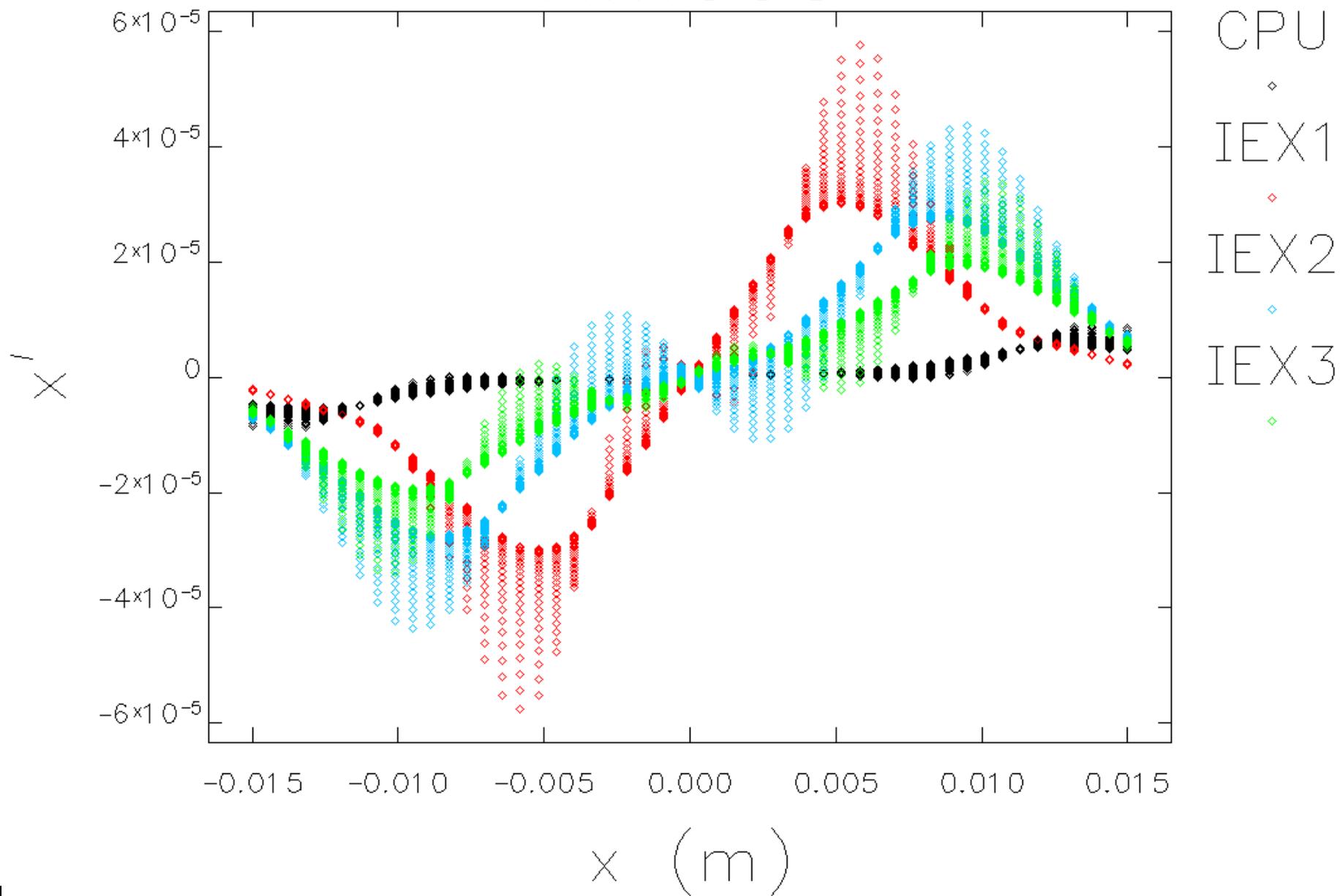
Same as before



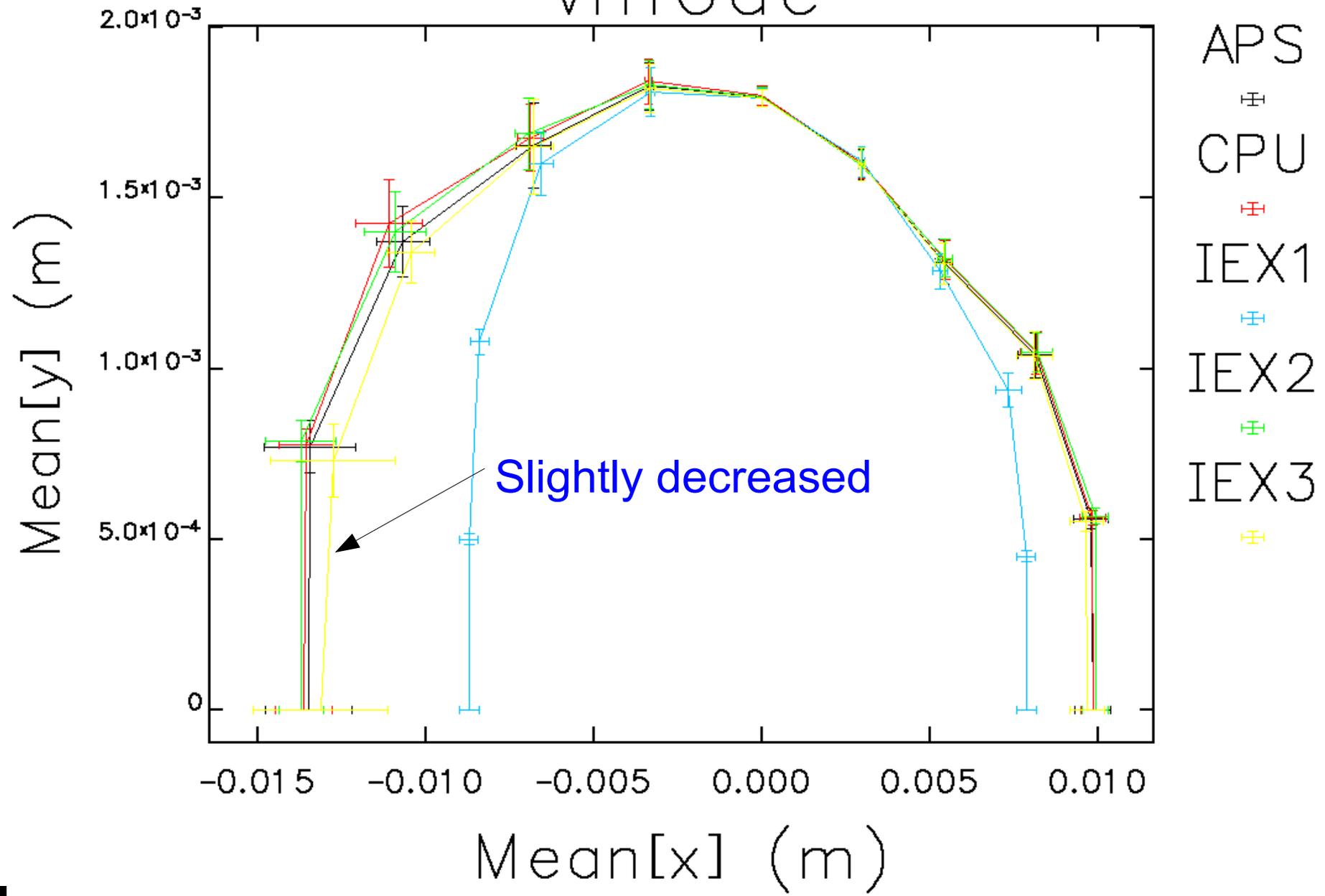
Hmode No obviously difference



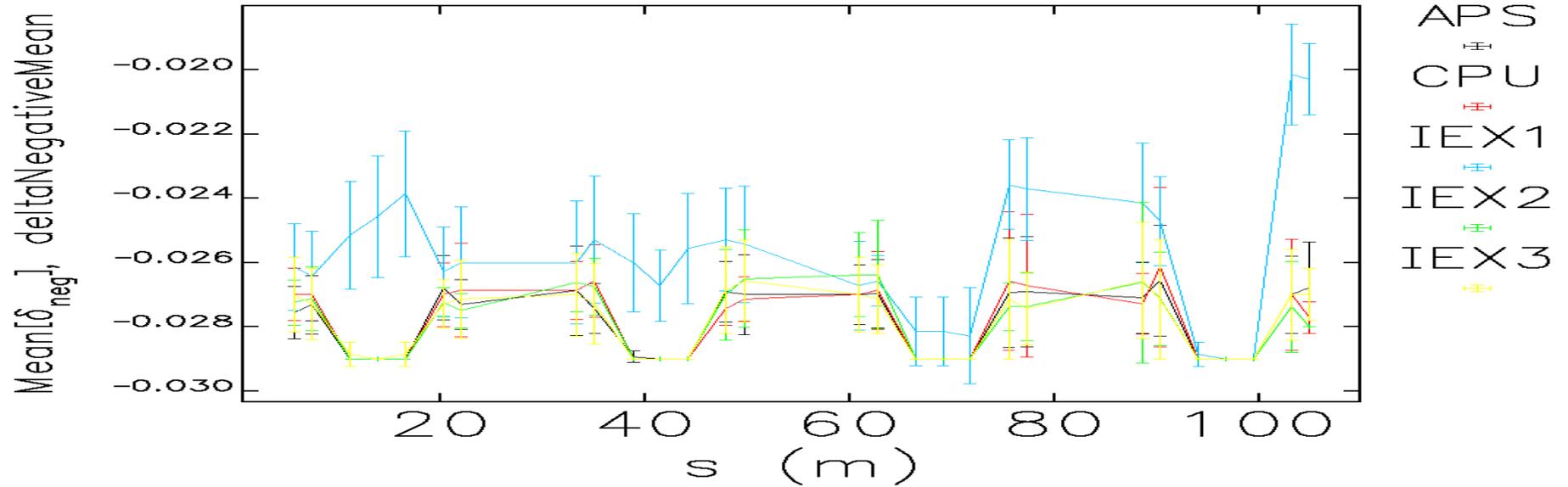
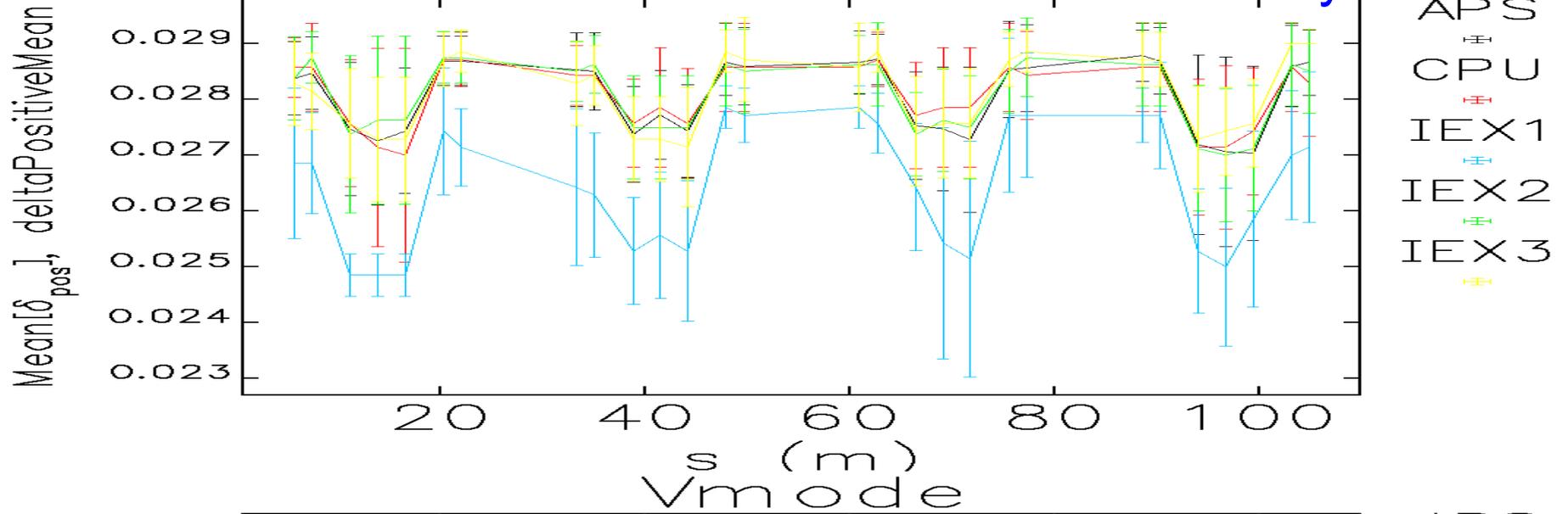
Hmode



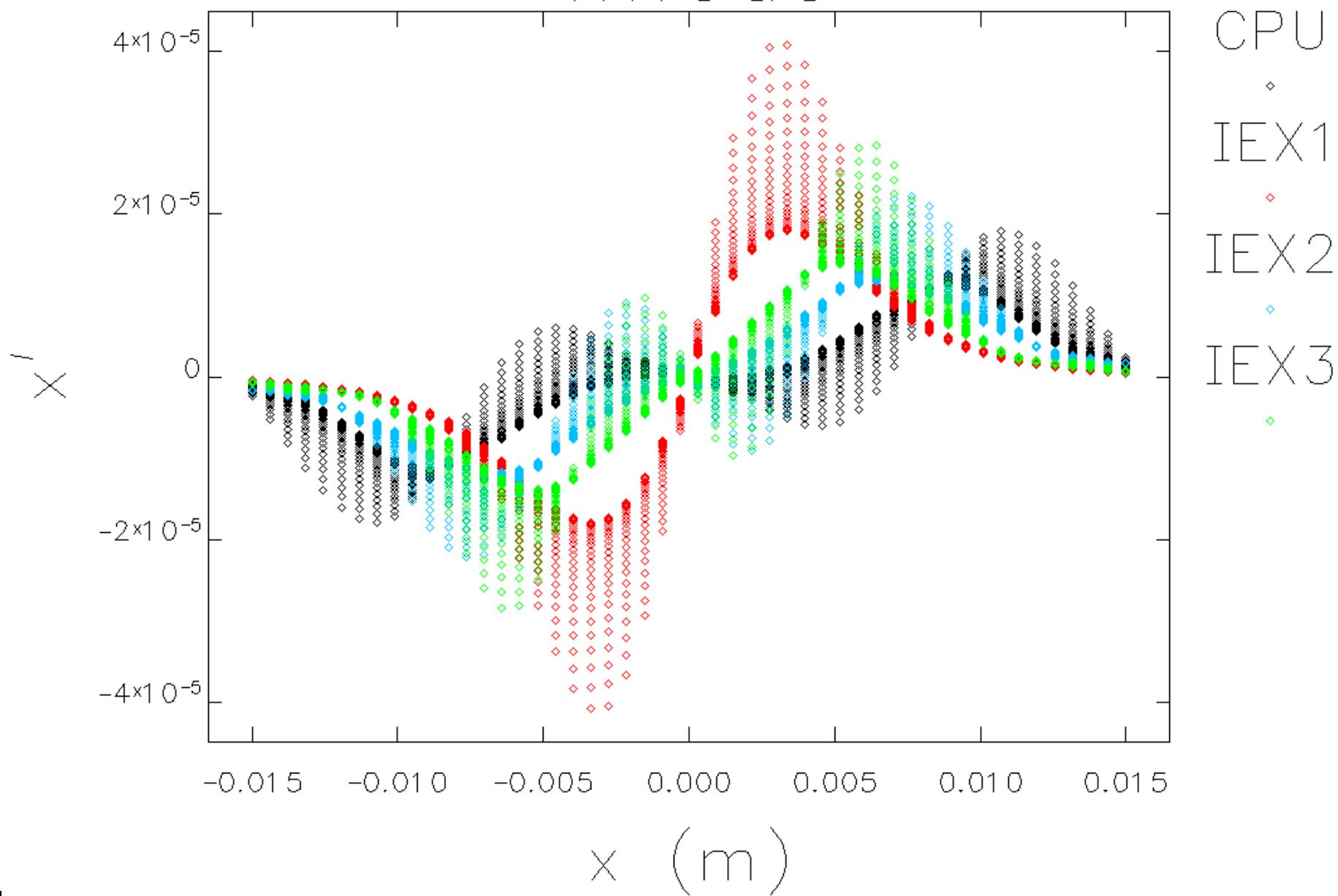
Vmode



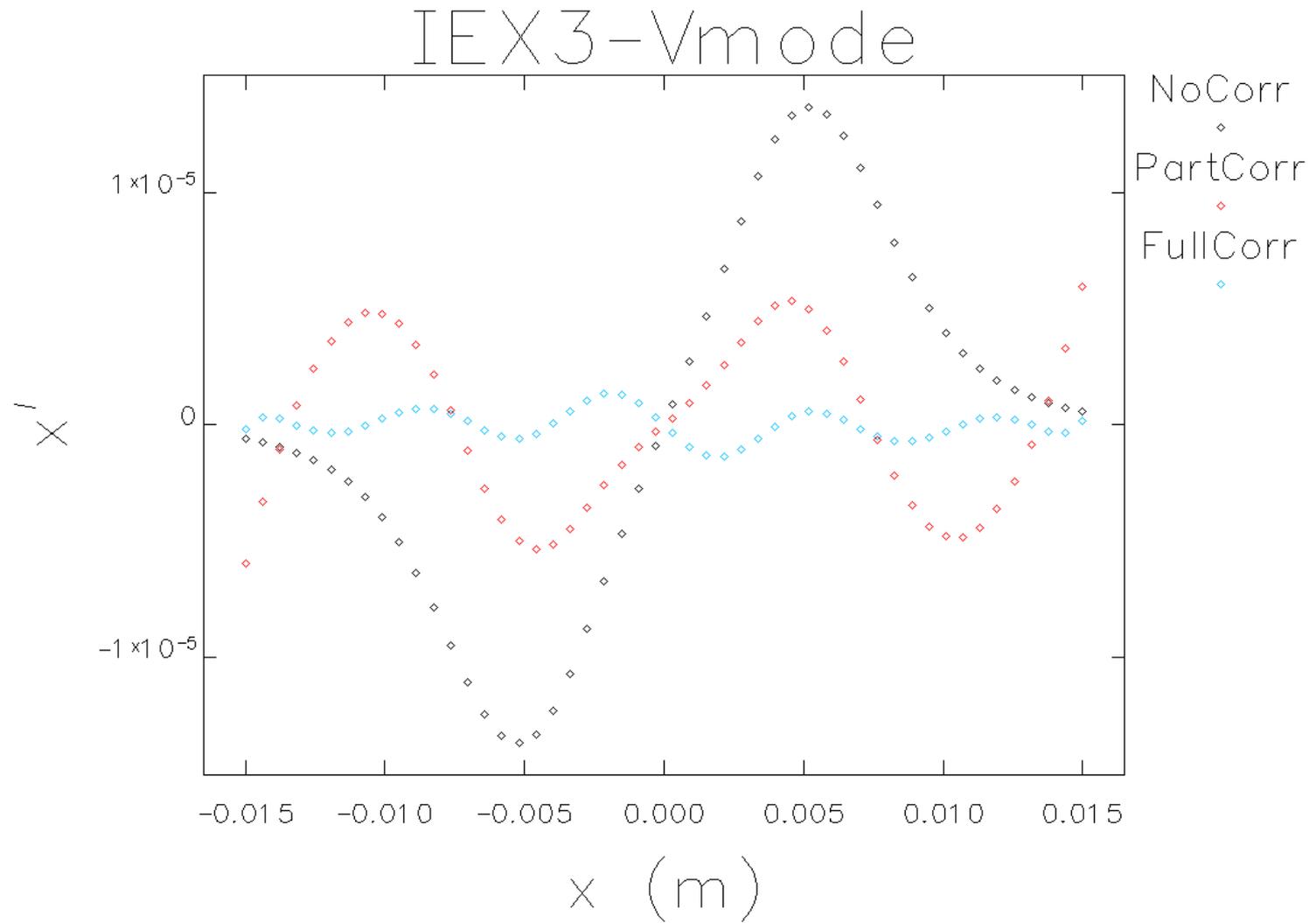
Vmode No obviously difference



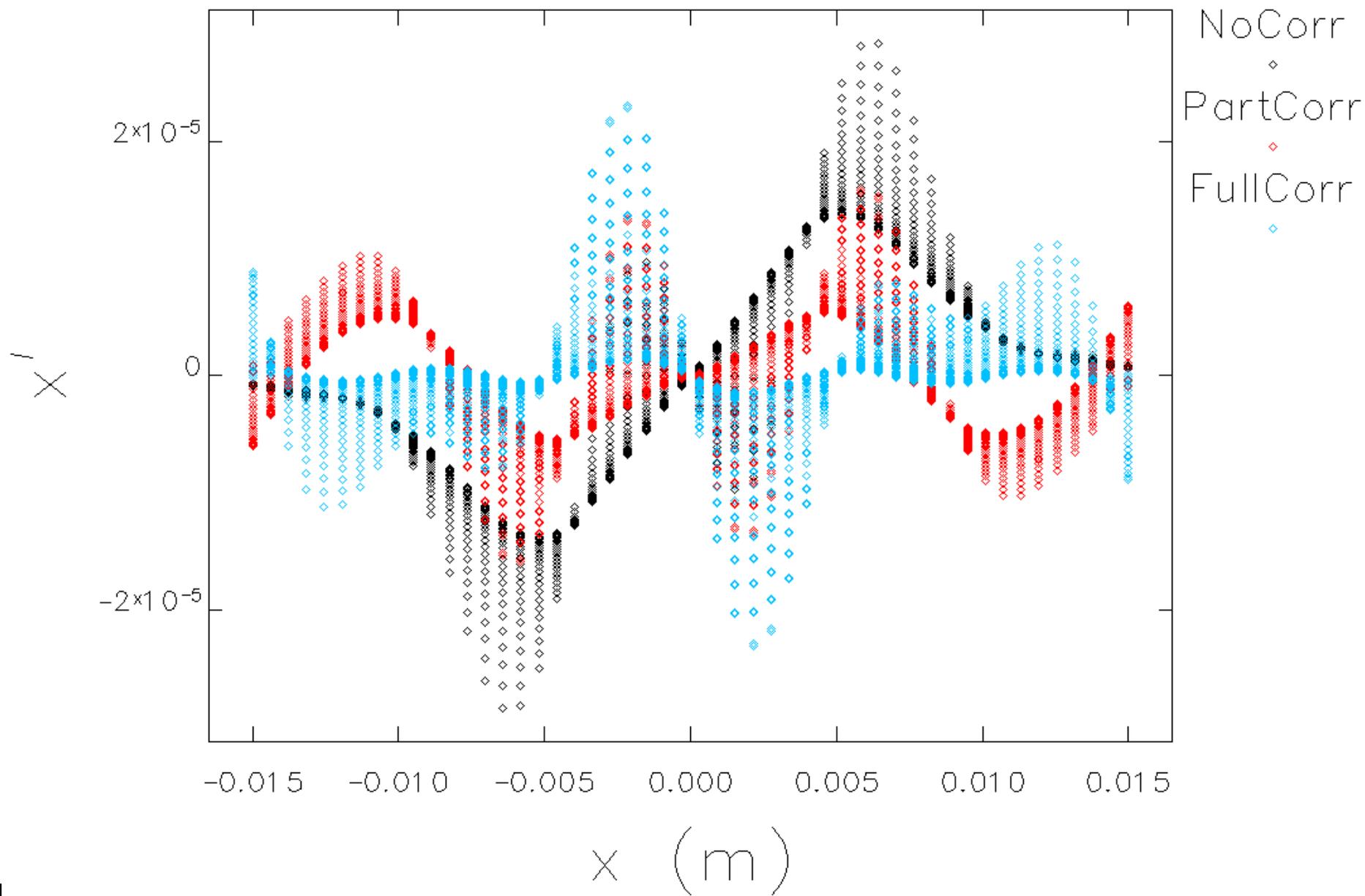
Vmode



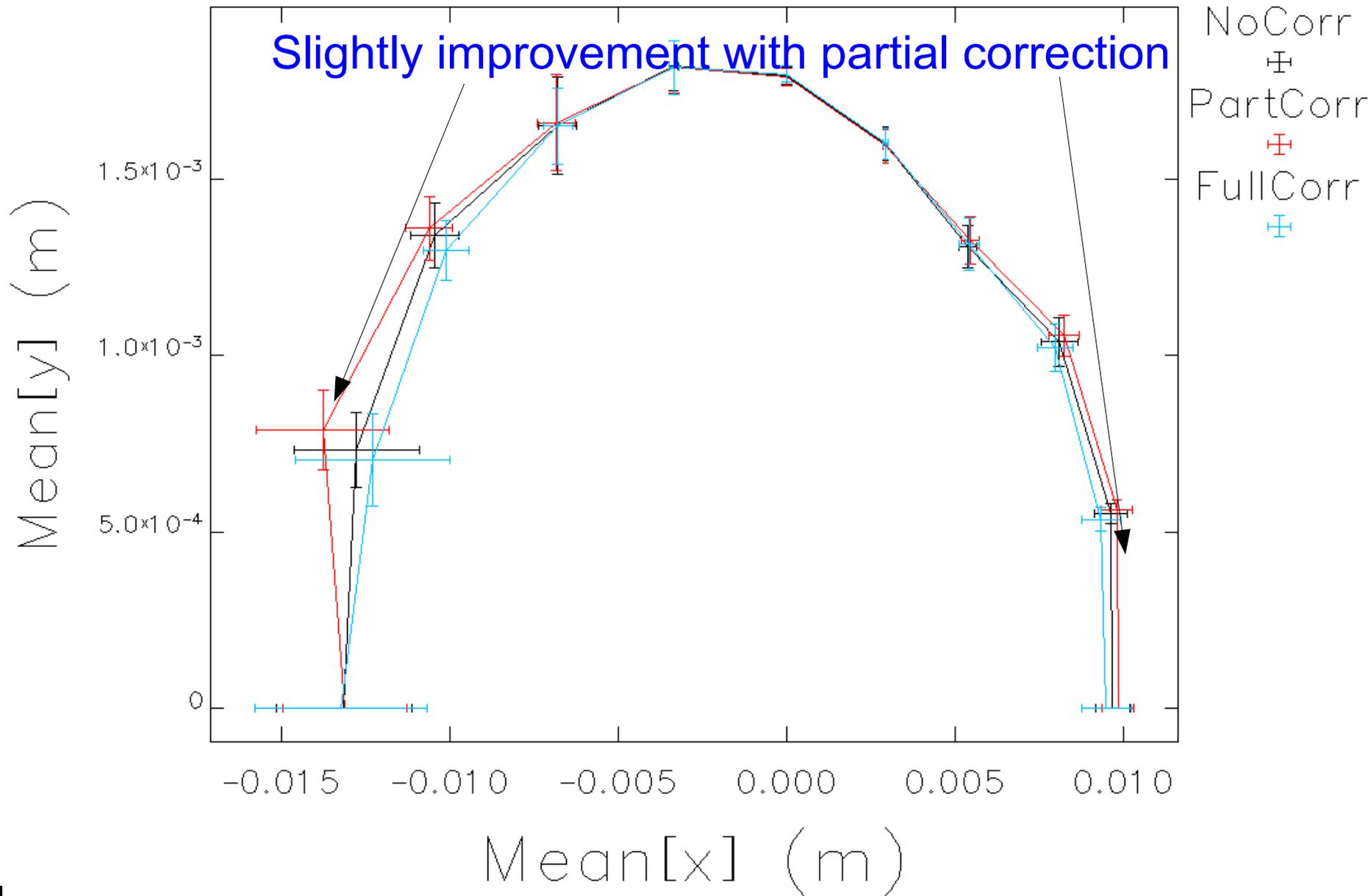
Attempt of correction



IE X3 - Vmode



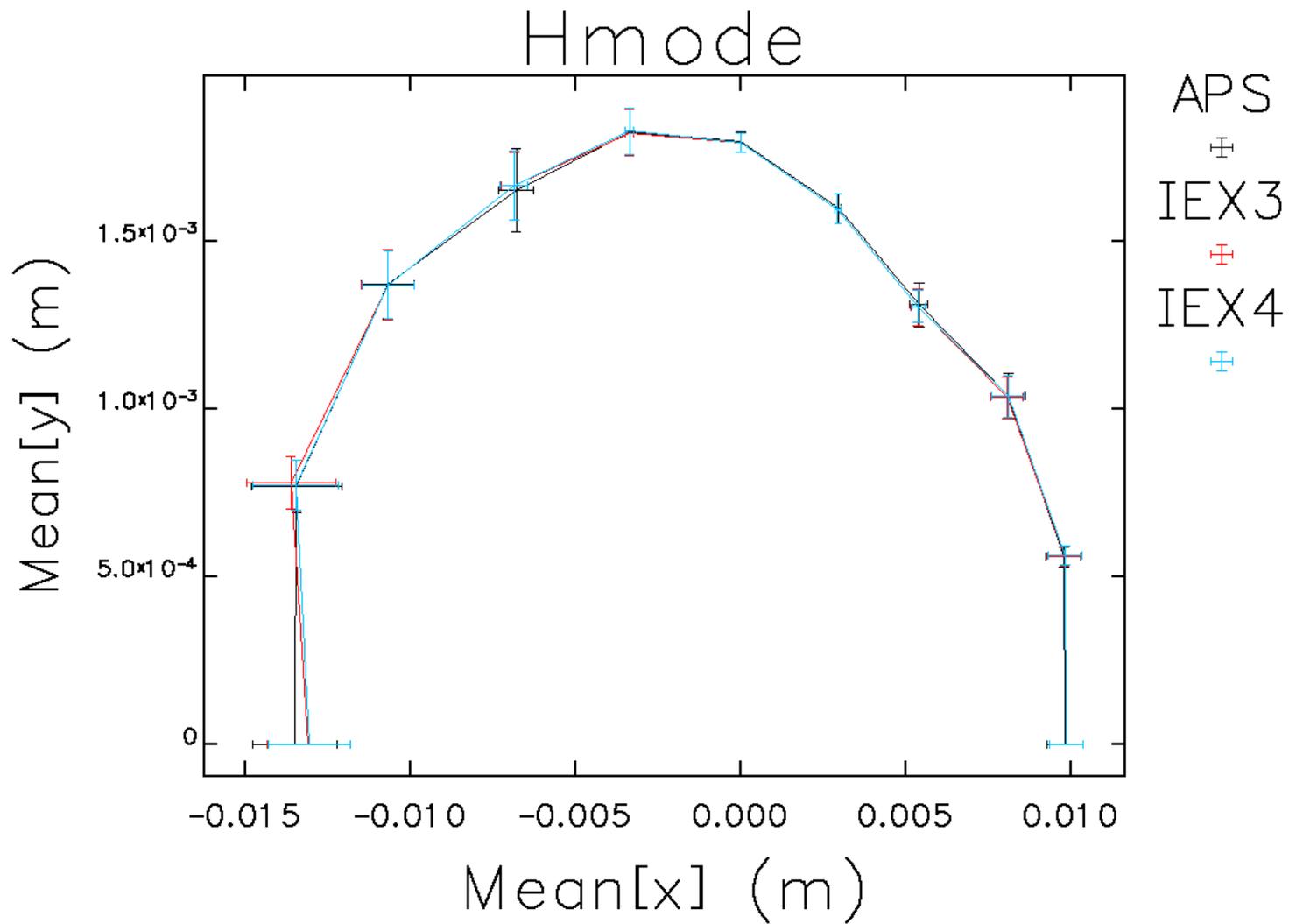
IEX3-Vmode



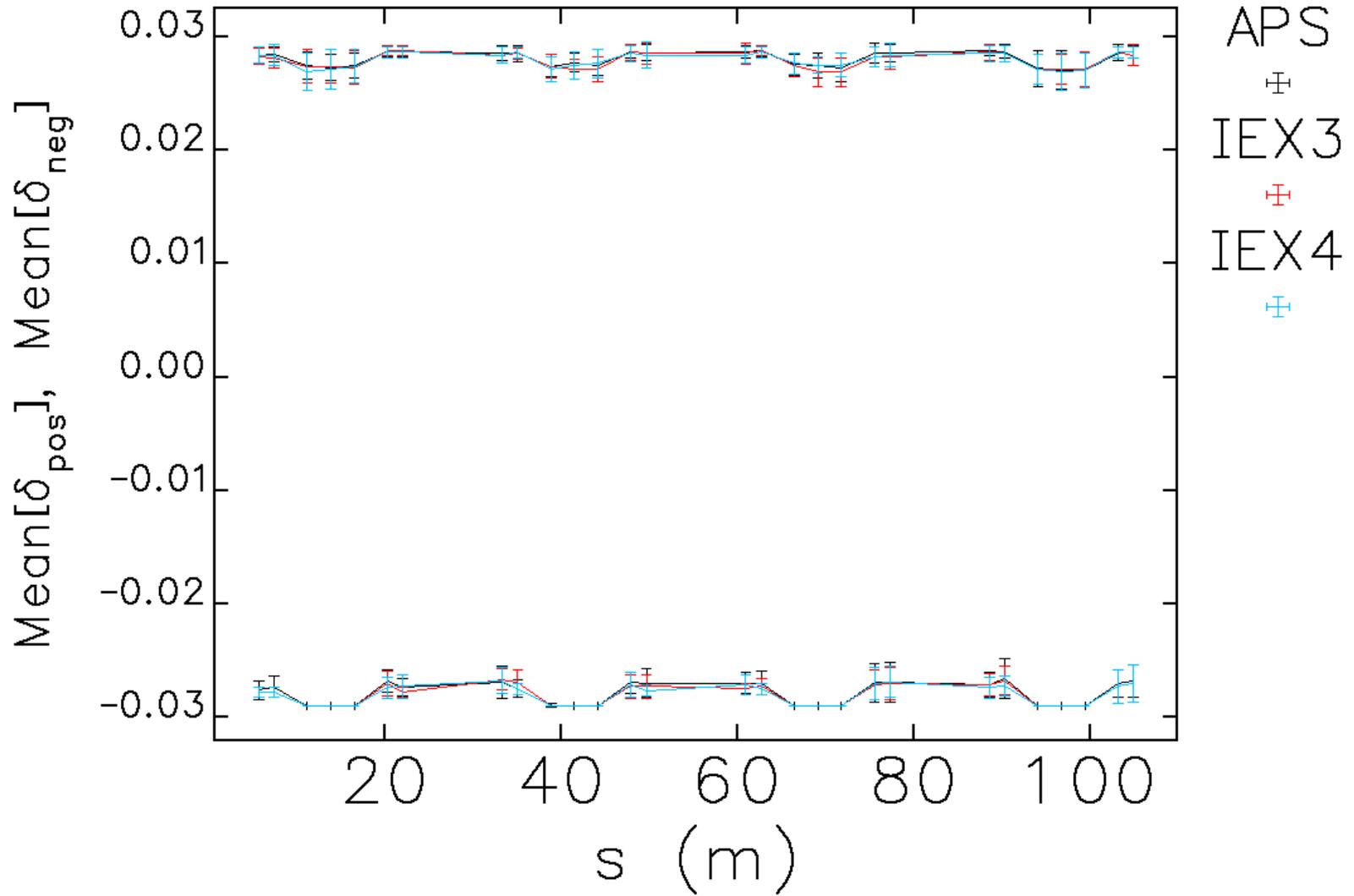
Summary

- No noticeable changes seen on MA – lifetime shouldn't be a problem
- Some decreasing of DA for V and C mode (Bx field)
 - Does this matters?
- IEX effect can not be canceled easily by make on-axis ($y=0$) kick = 0.
 - Some improvement can be reached by a partial cancellation.
- Question:
 - How good real magnet close to the simulation model?
 - Simulate with errors – misalignment and fields, etc.
 - *Now only lattice error (Quad., Sextupoles are taken into account)*

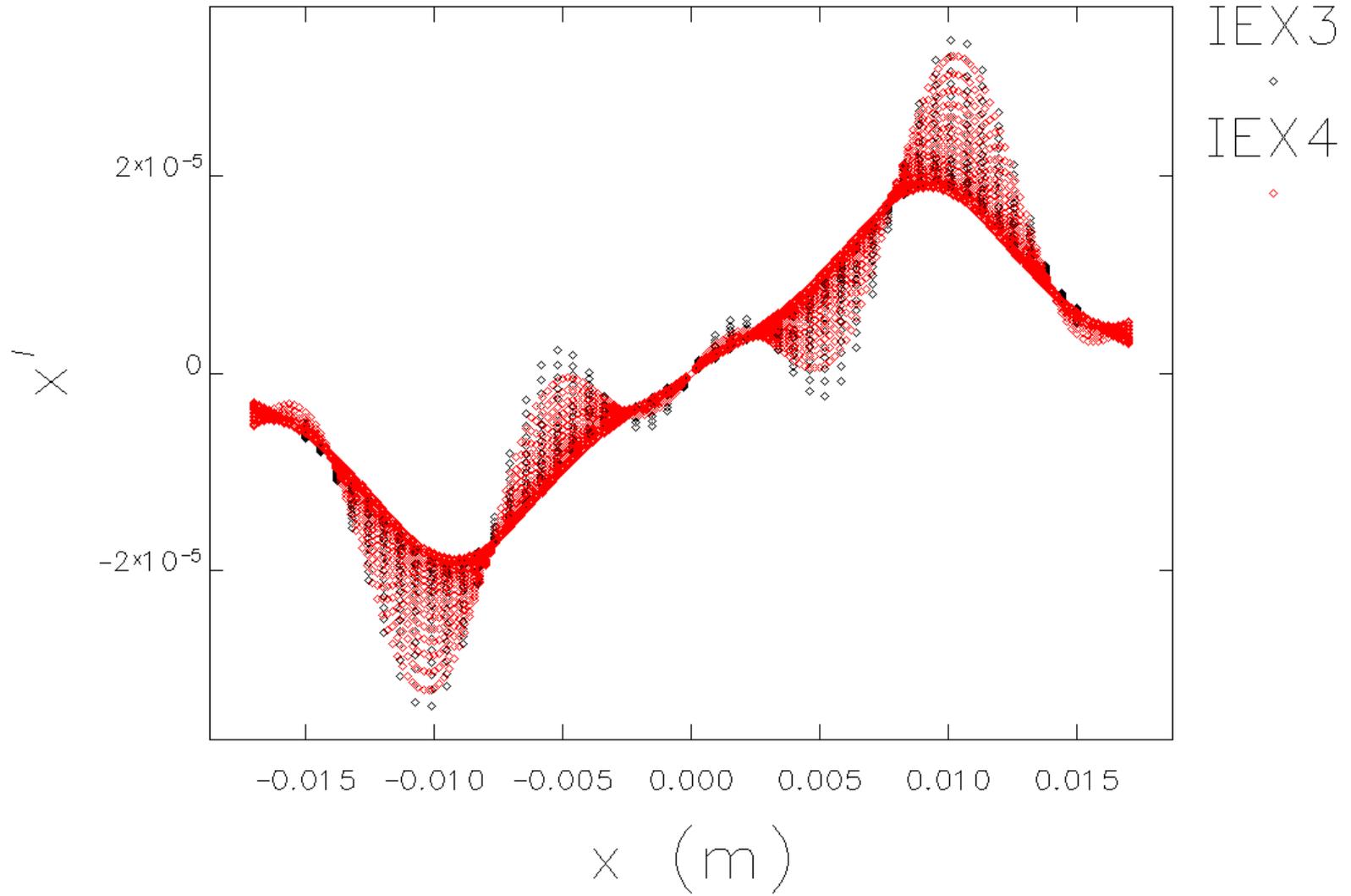
New Results for IEX4 – Nov. 20



Hmode

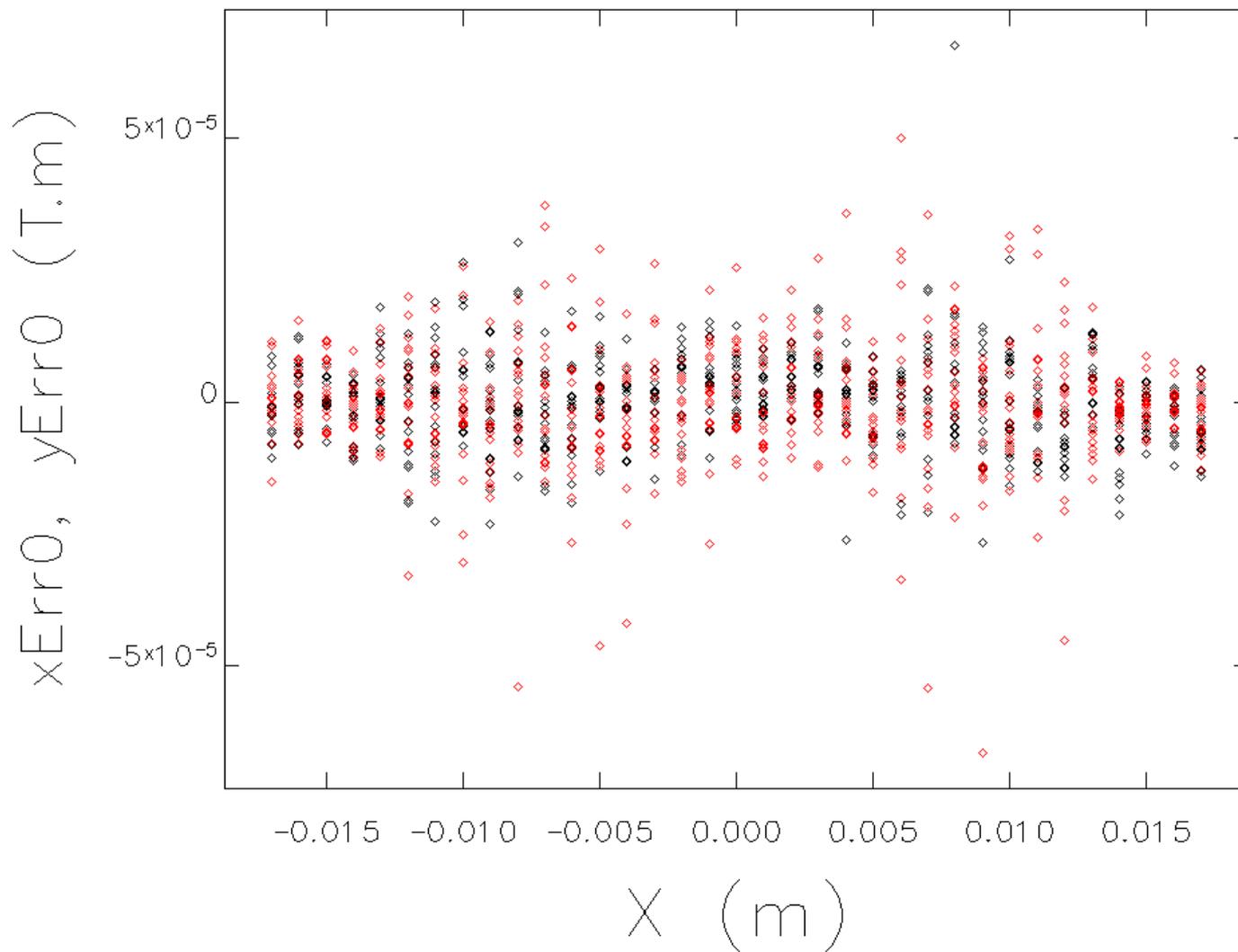


Hmode

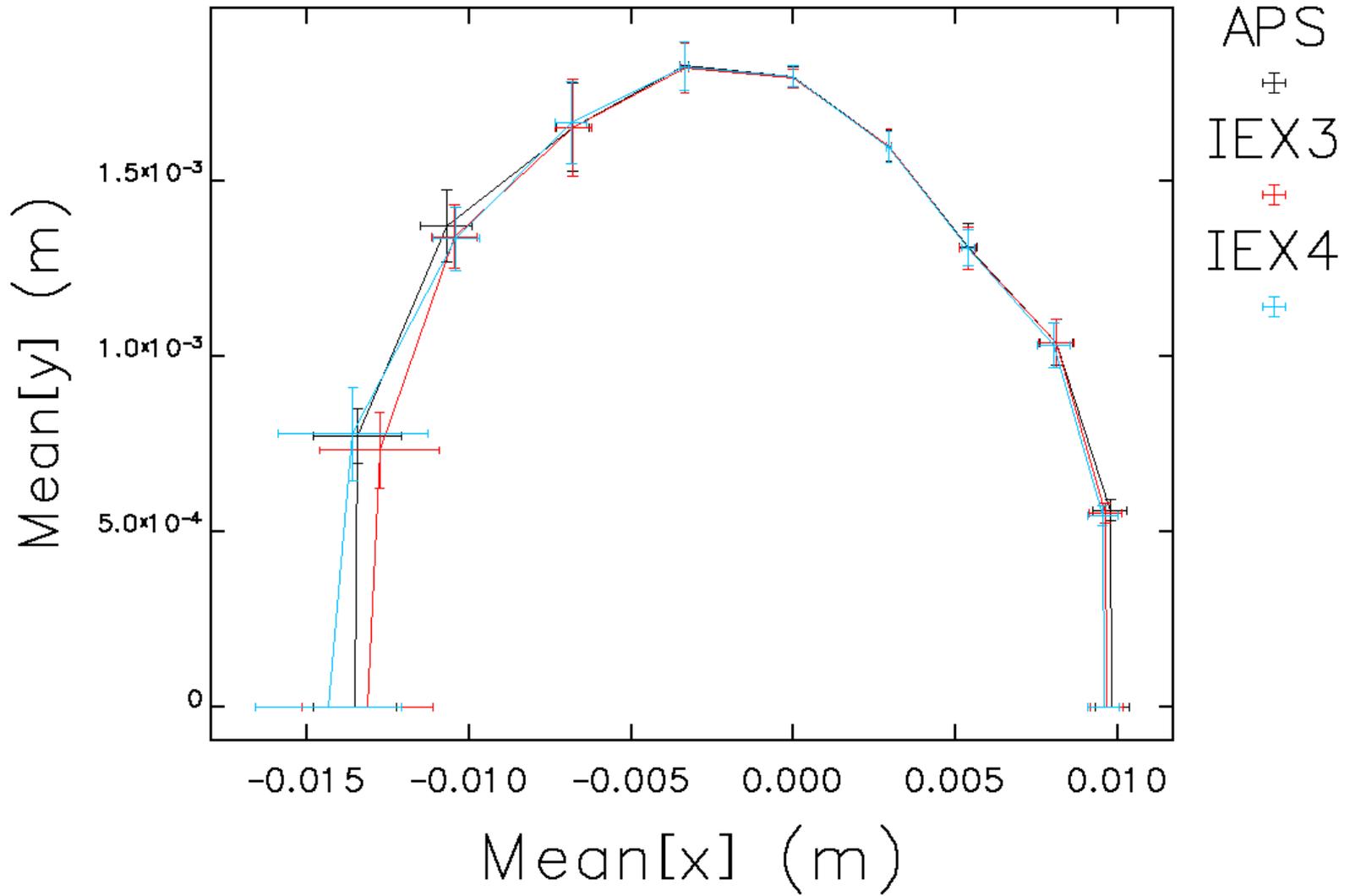


H-IEX4

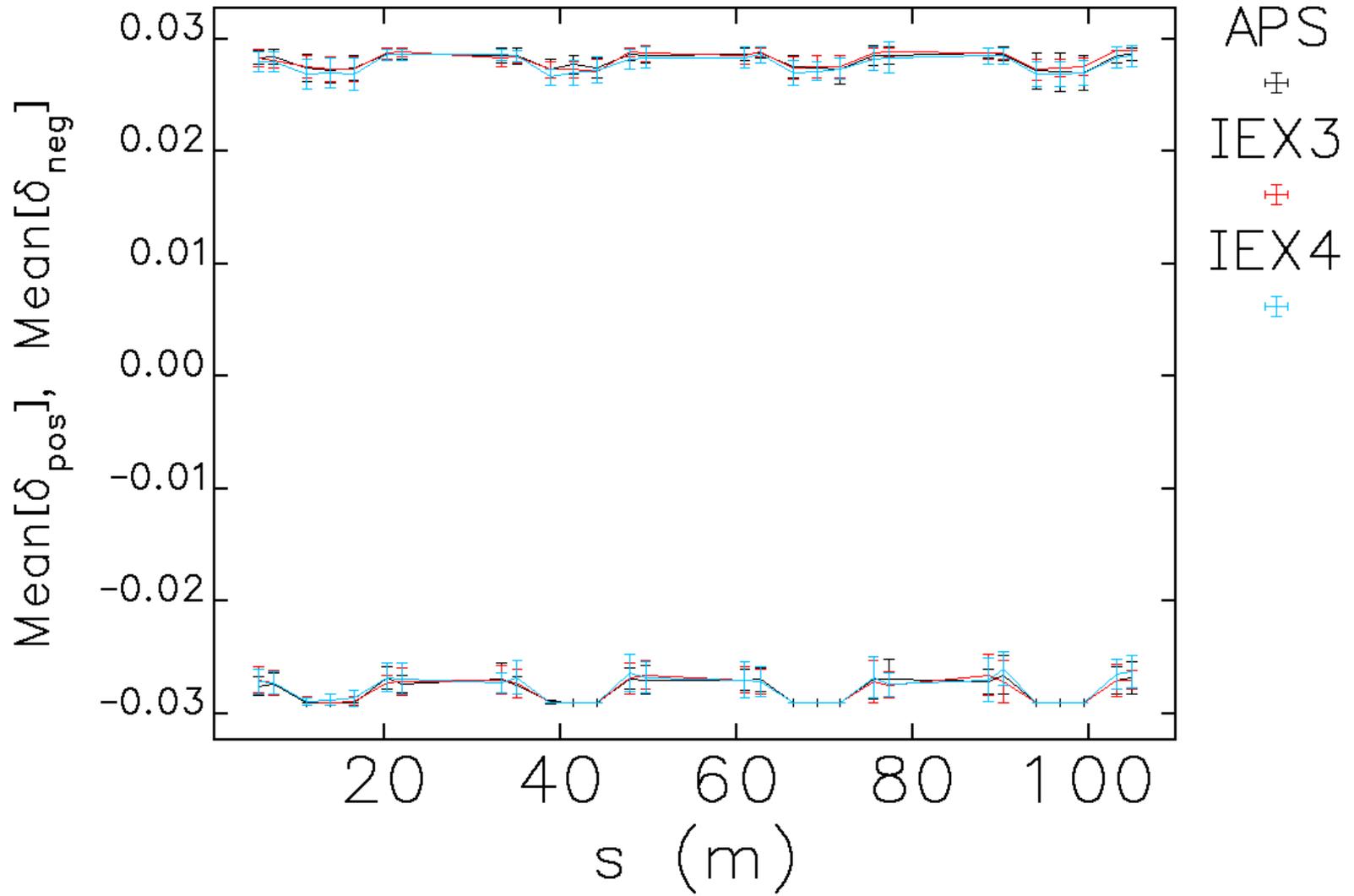
Field fitting quality



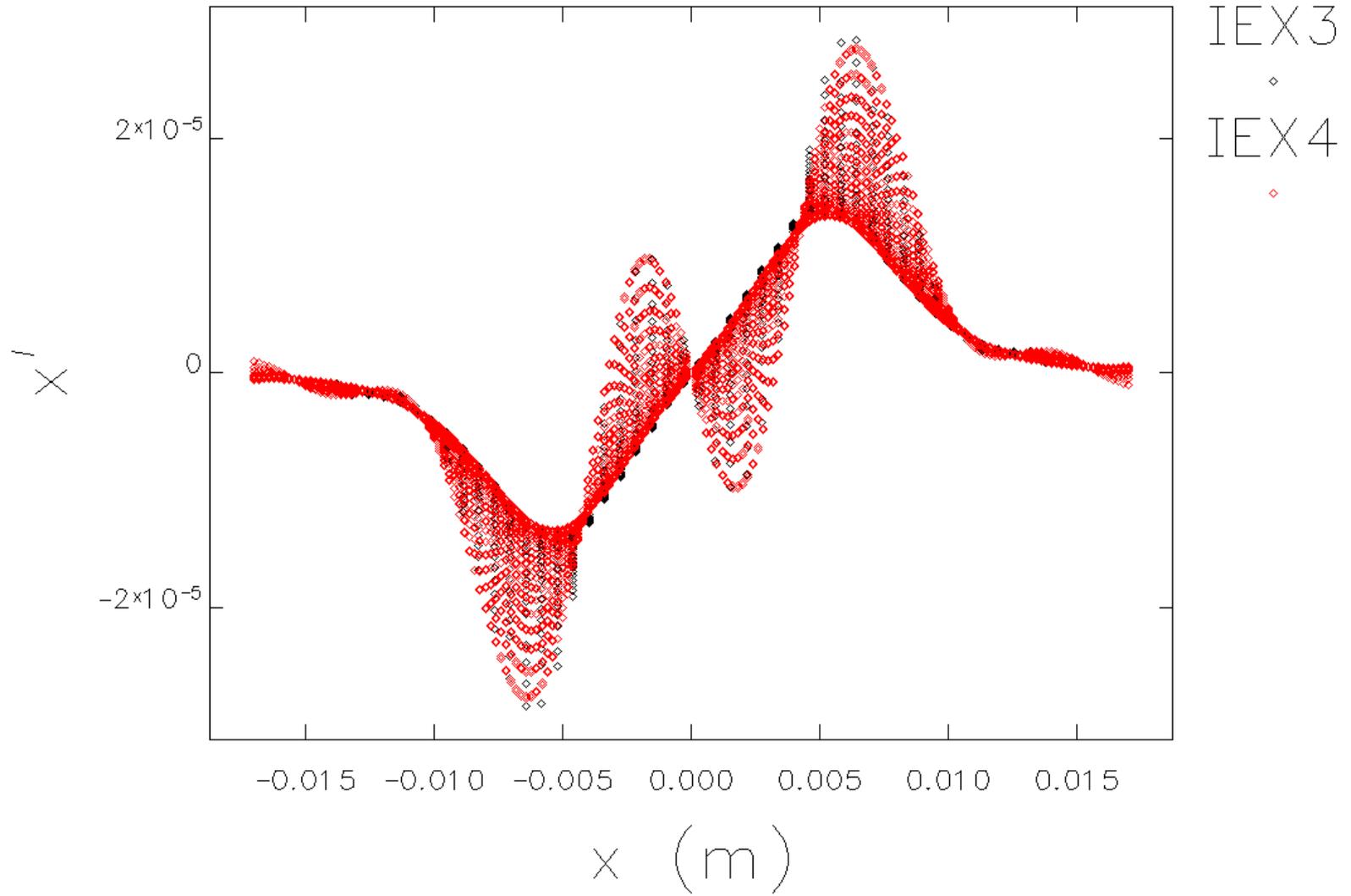
Vmode



Vmode

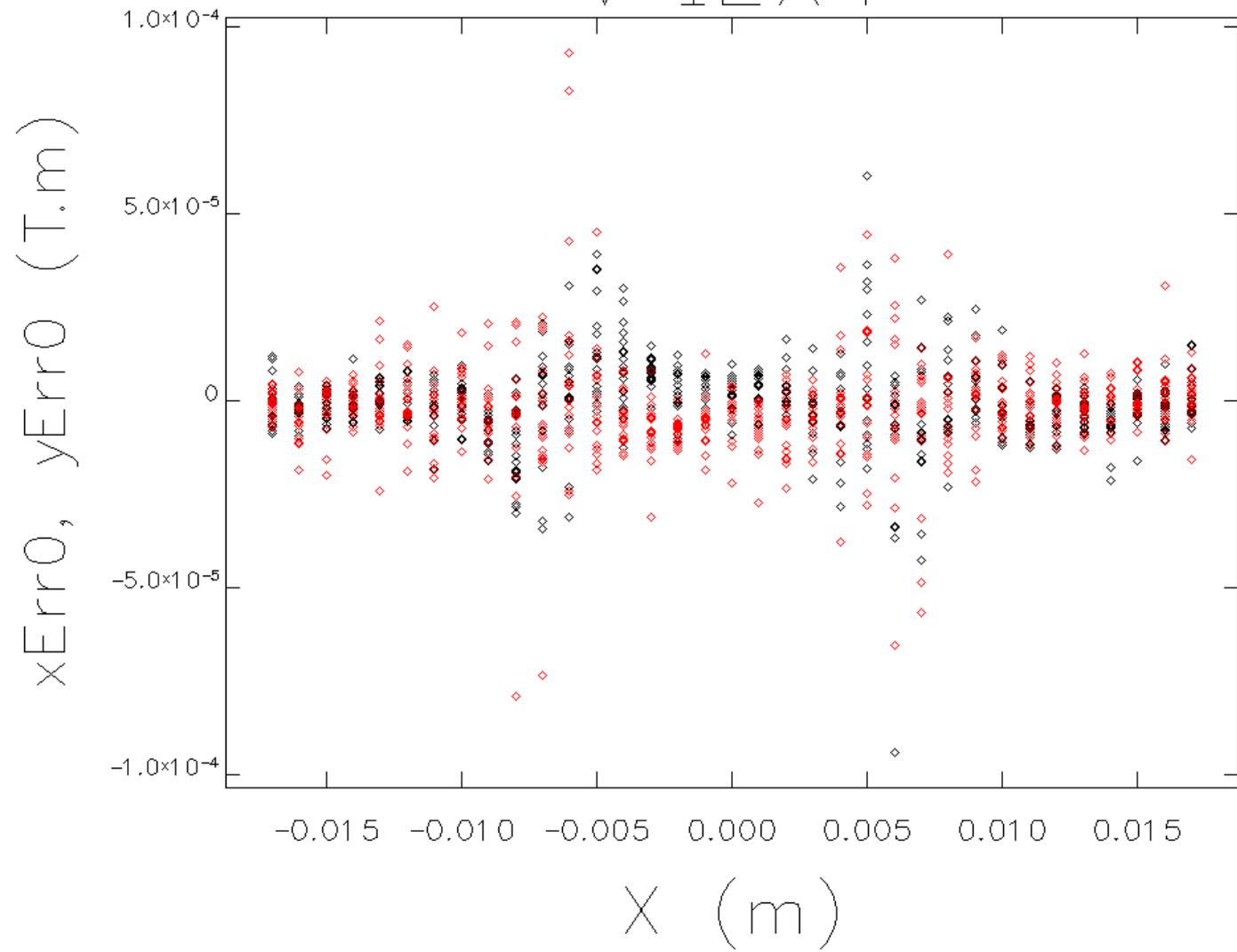


Vmode

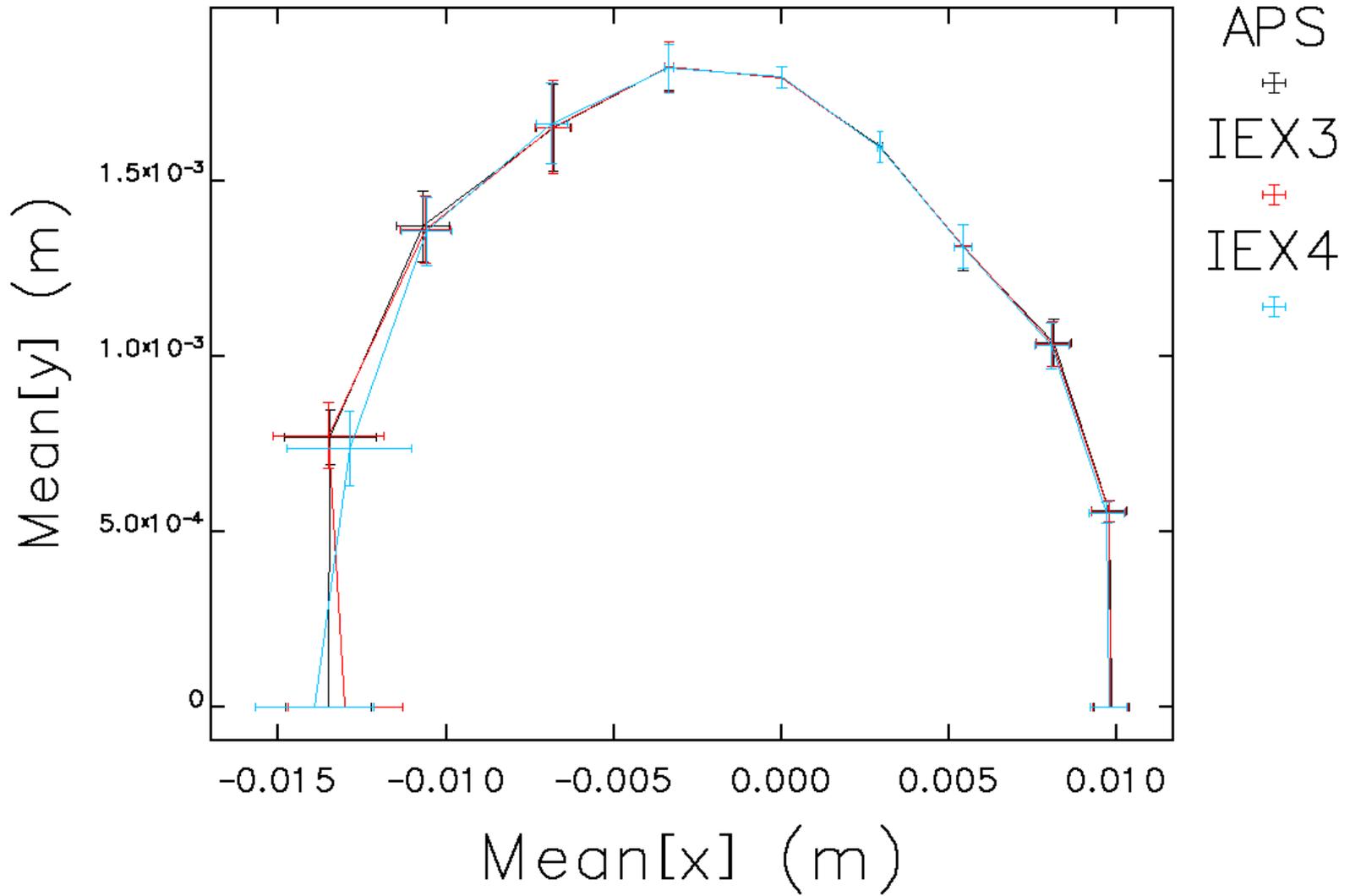


V-IE X4

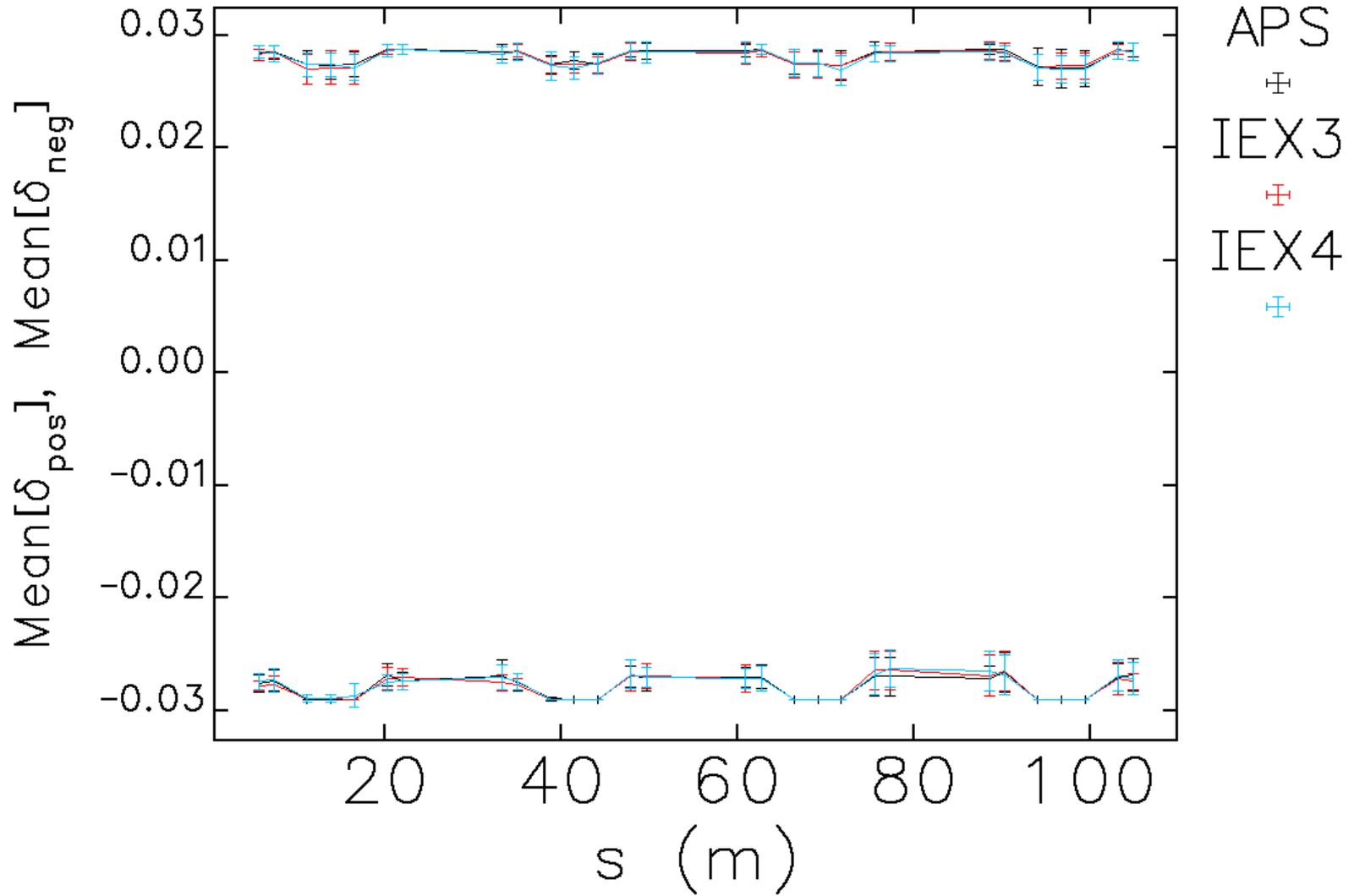
Field fitting quality



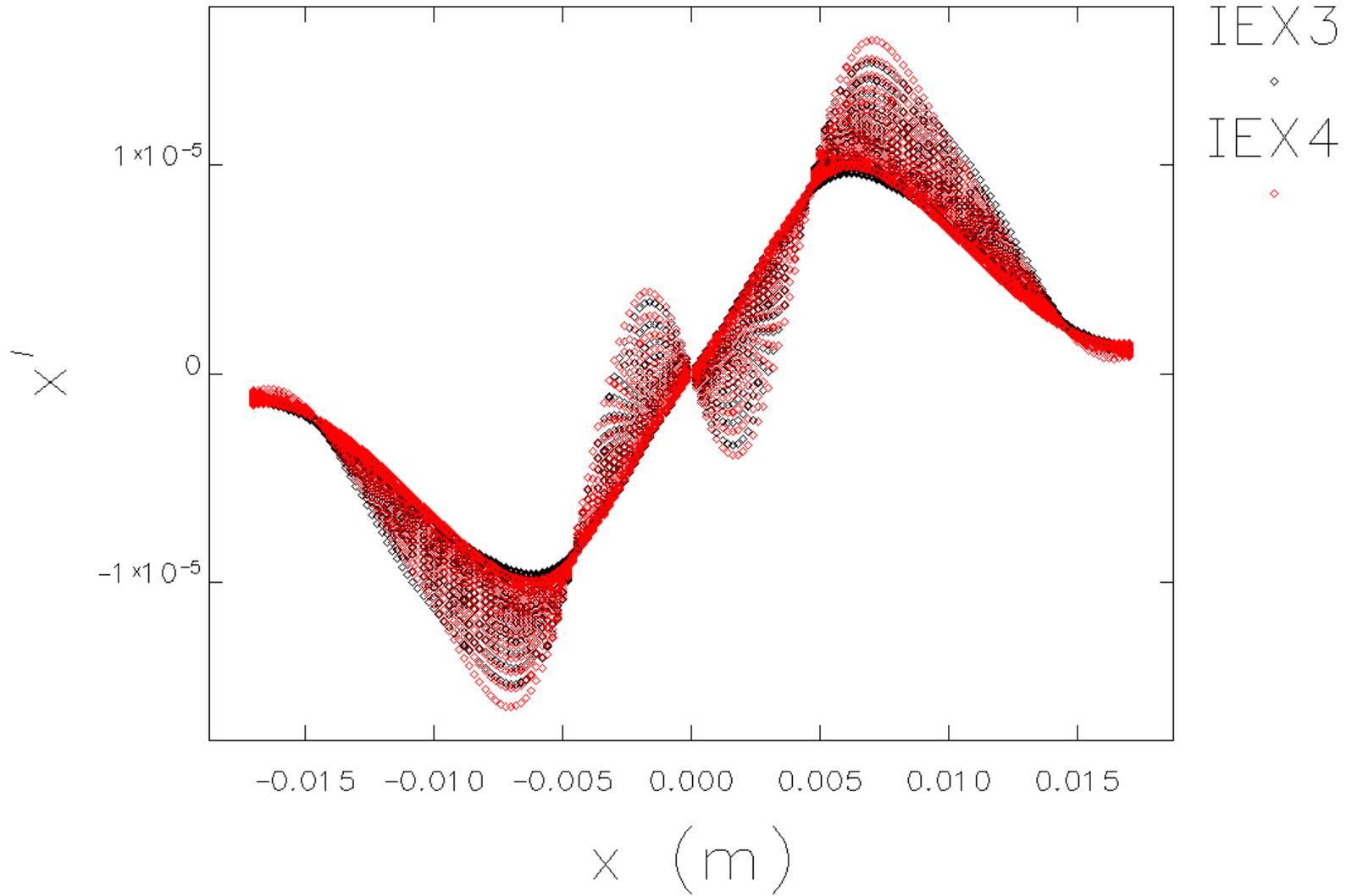
Cmode



Cmode

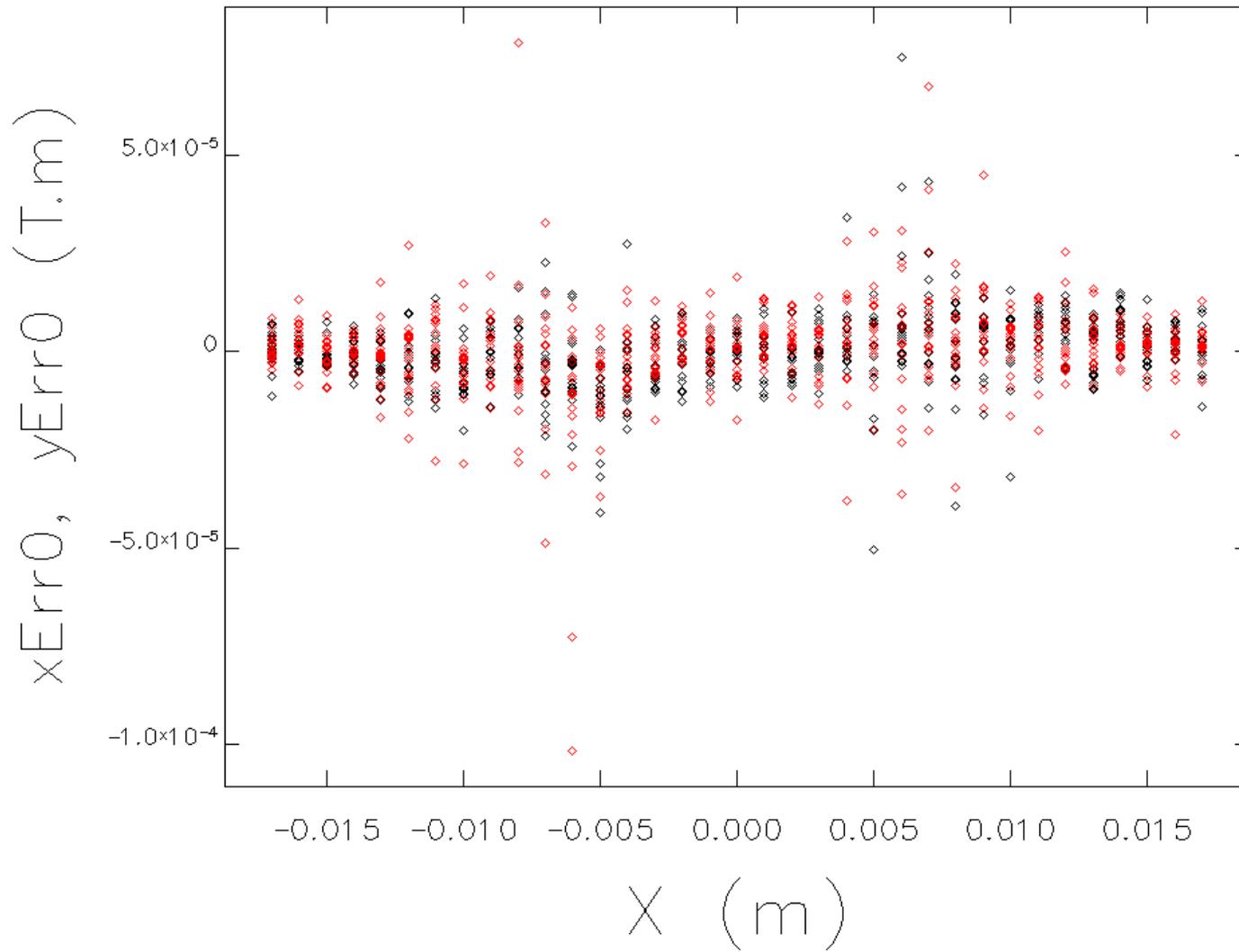


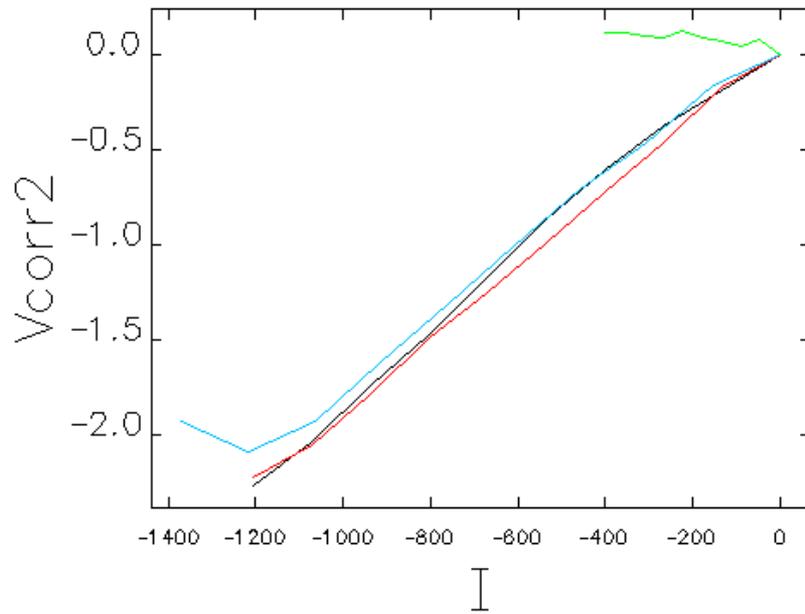
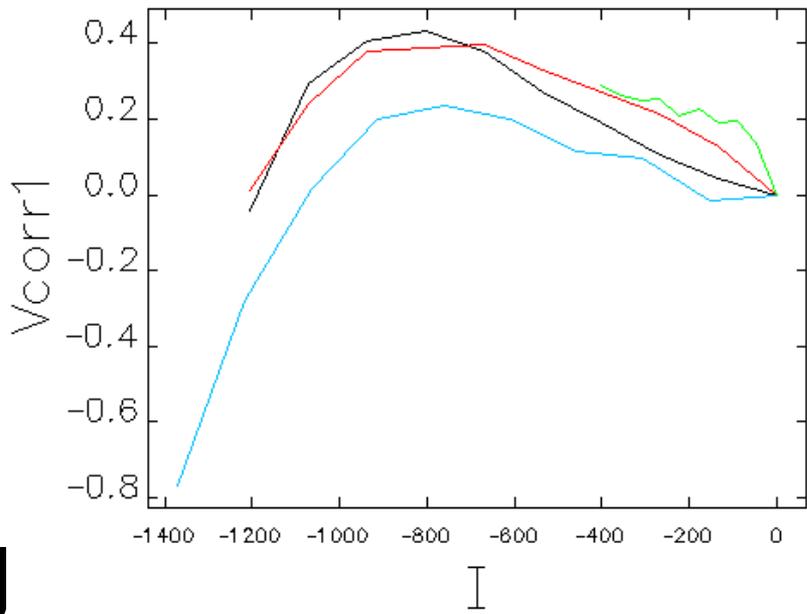
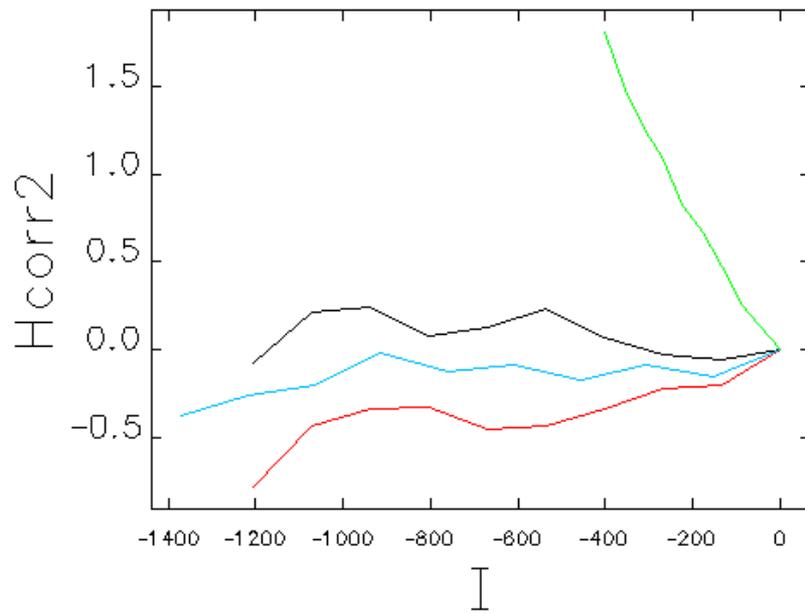
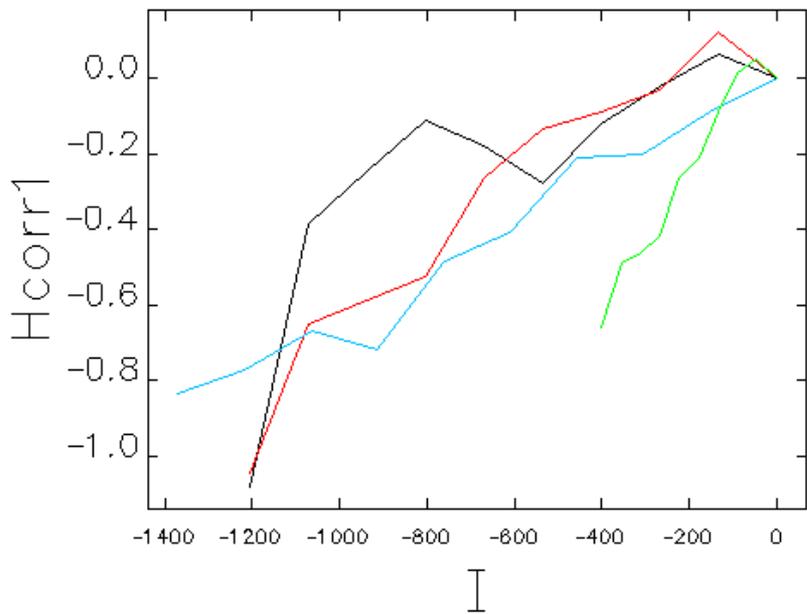
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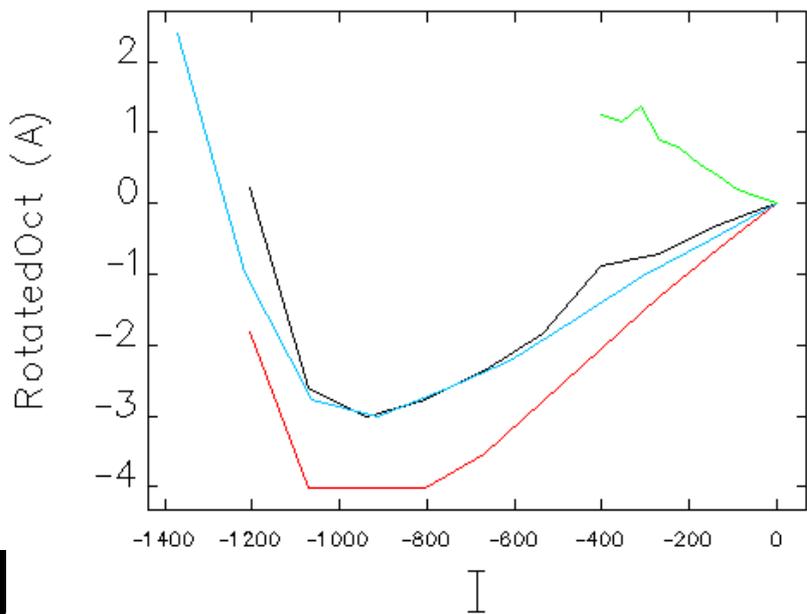
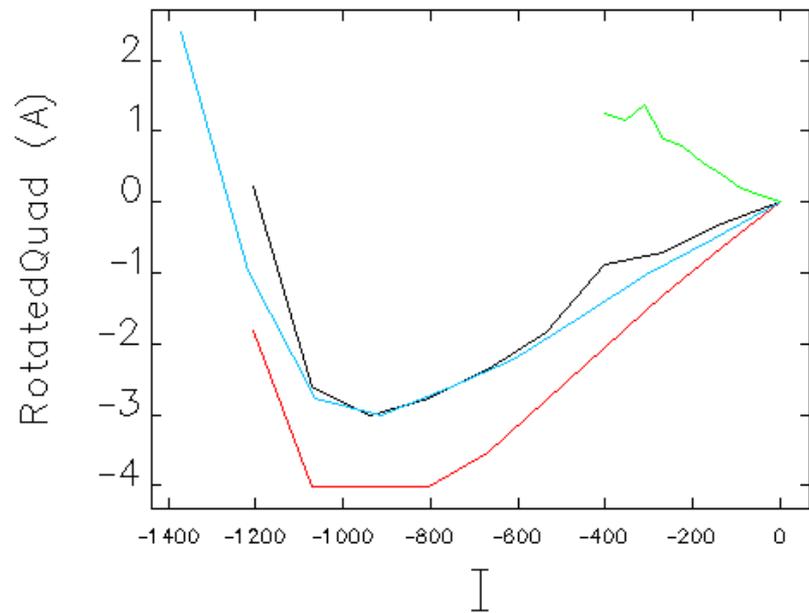
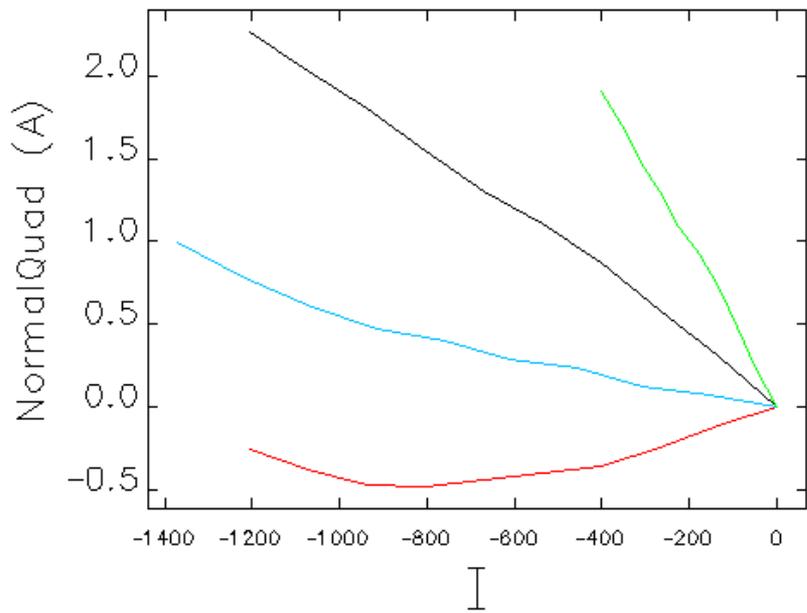


C-IE X4

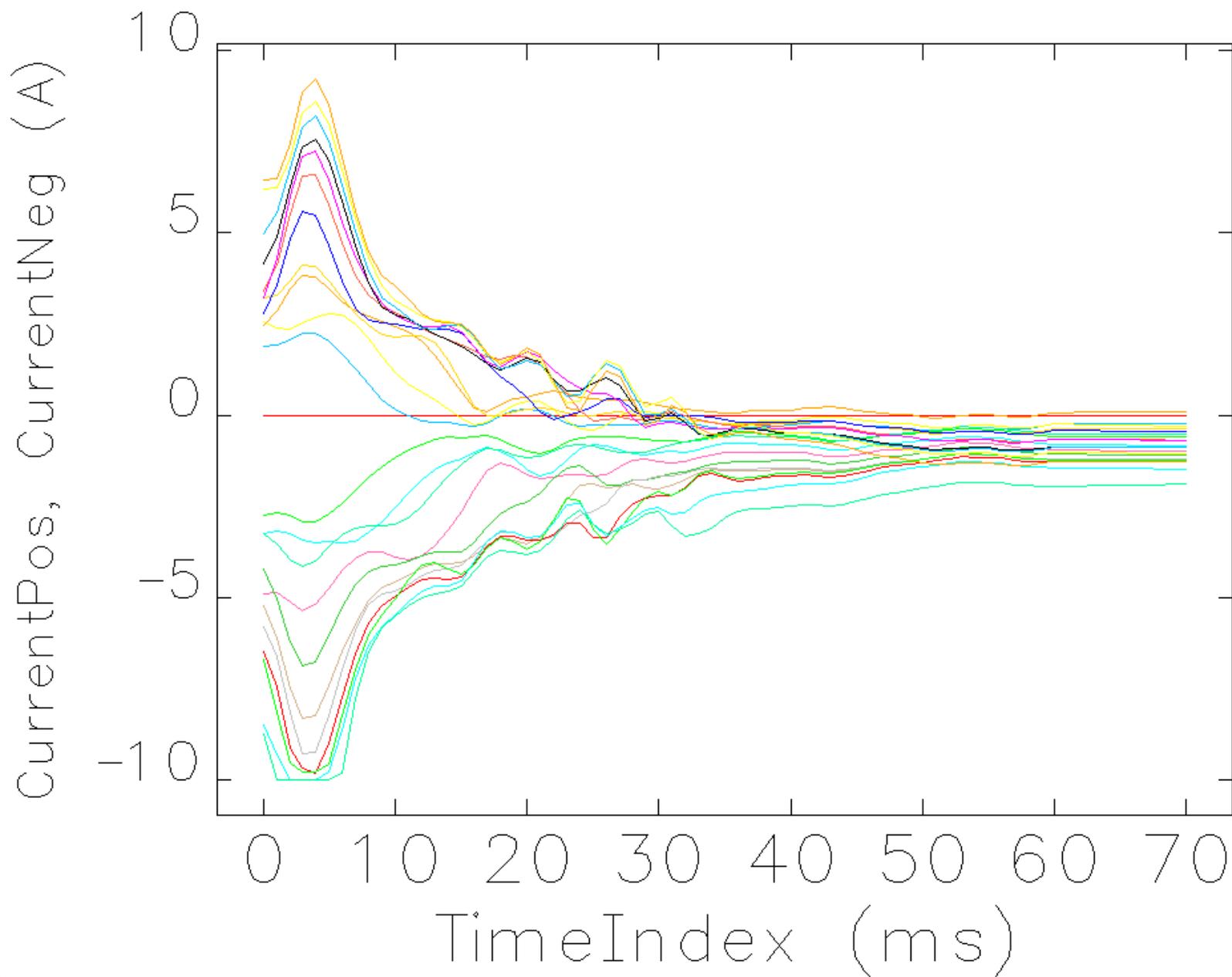
Field fitting quality

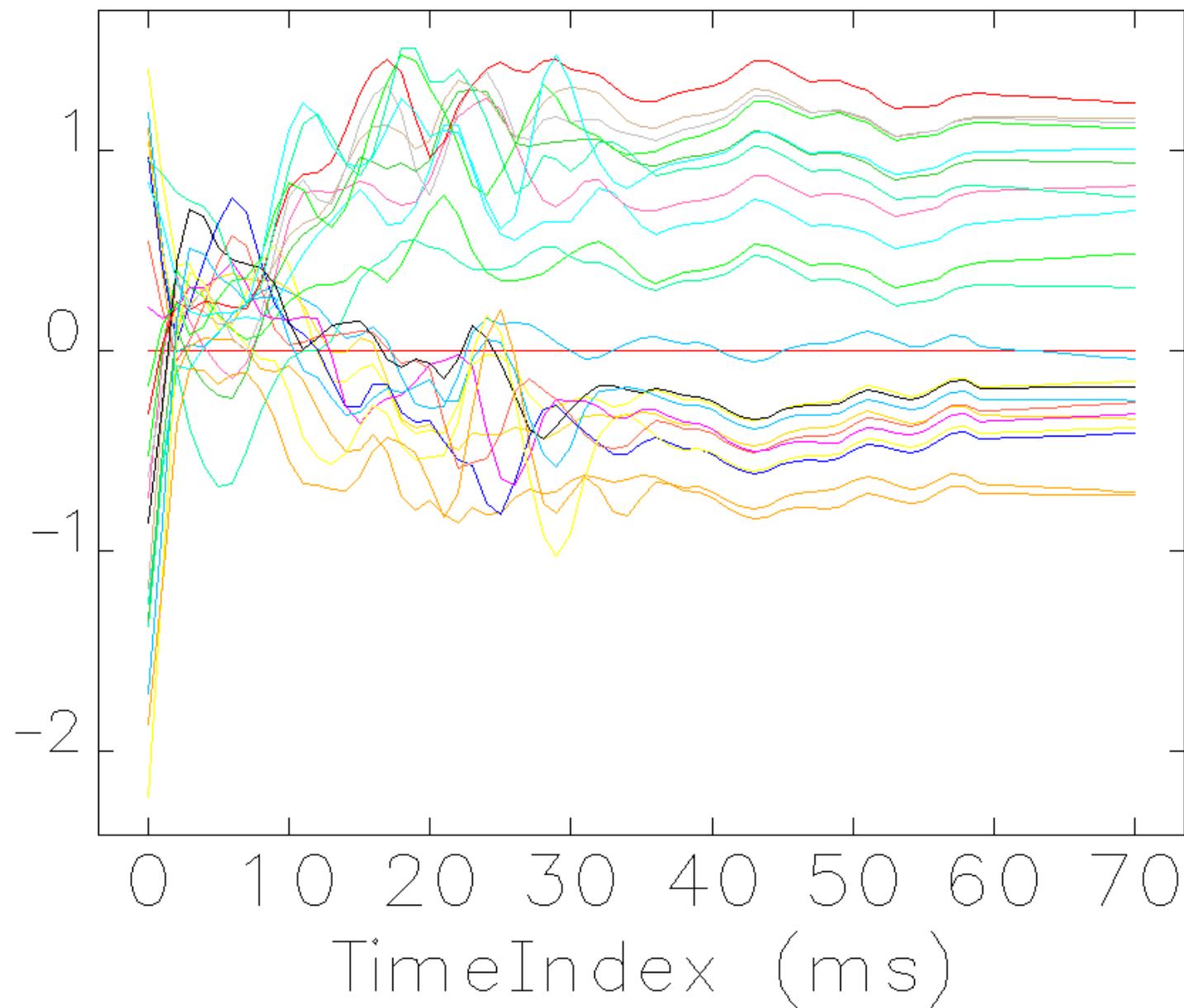




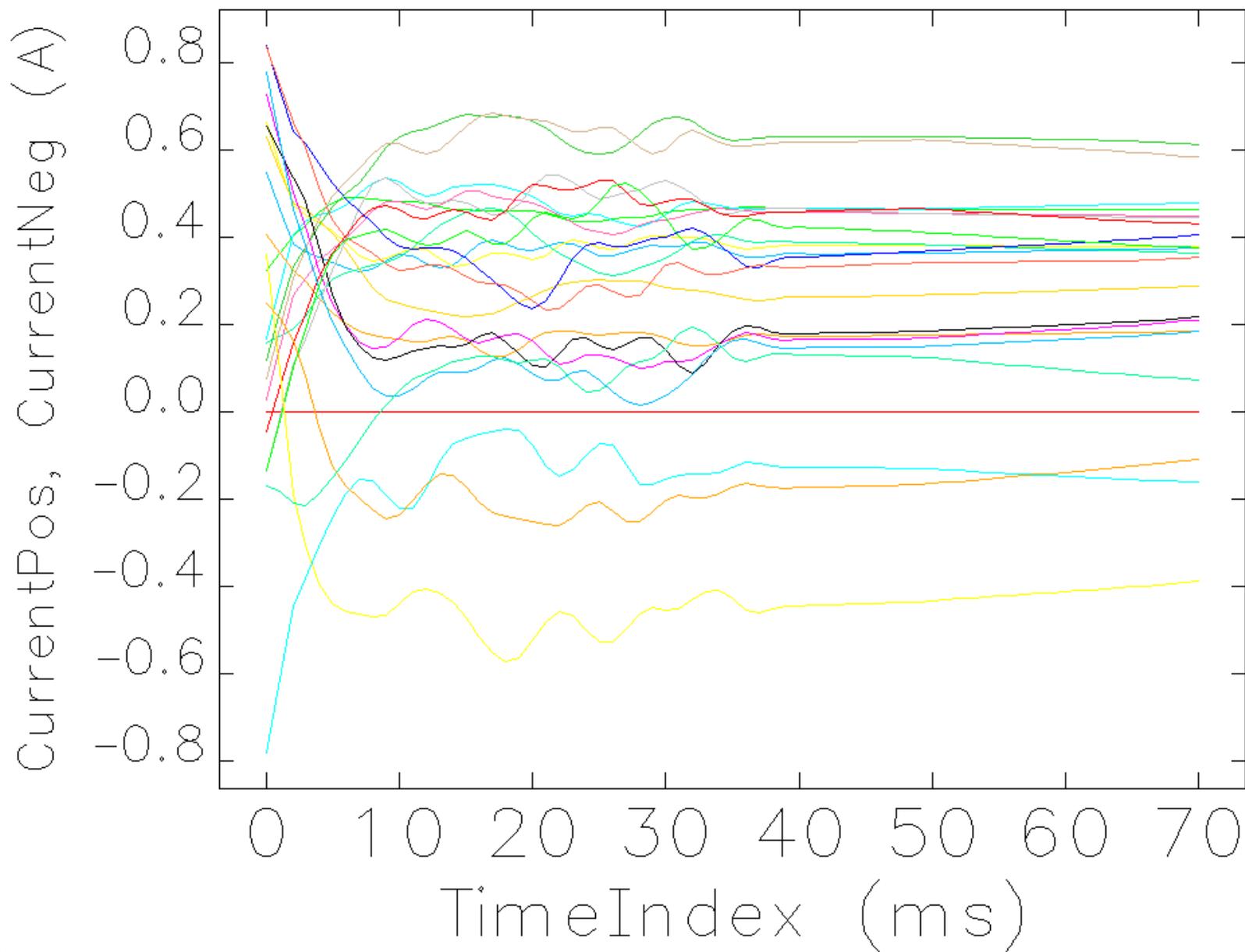


Hcorr1

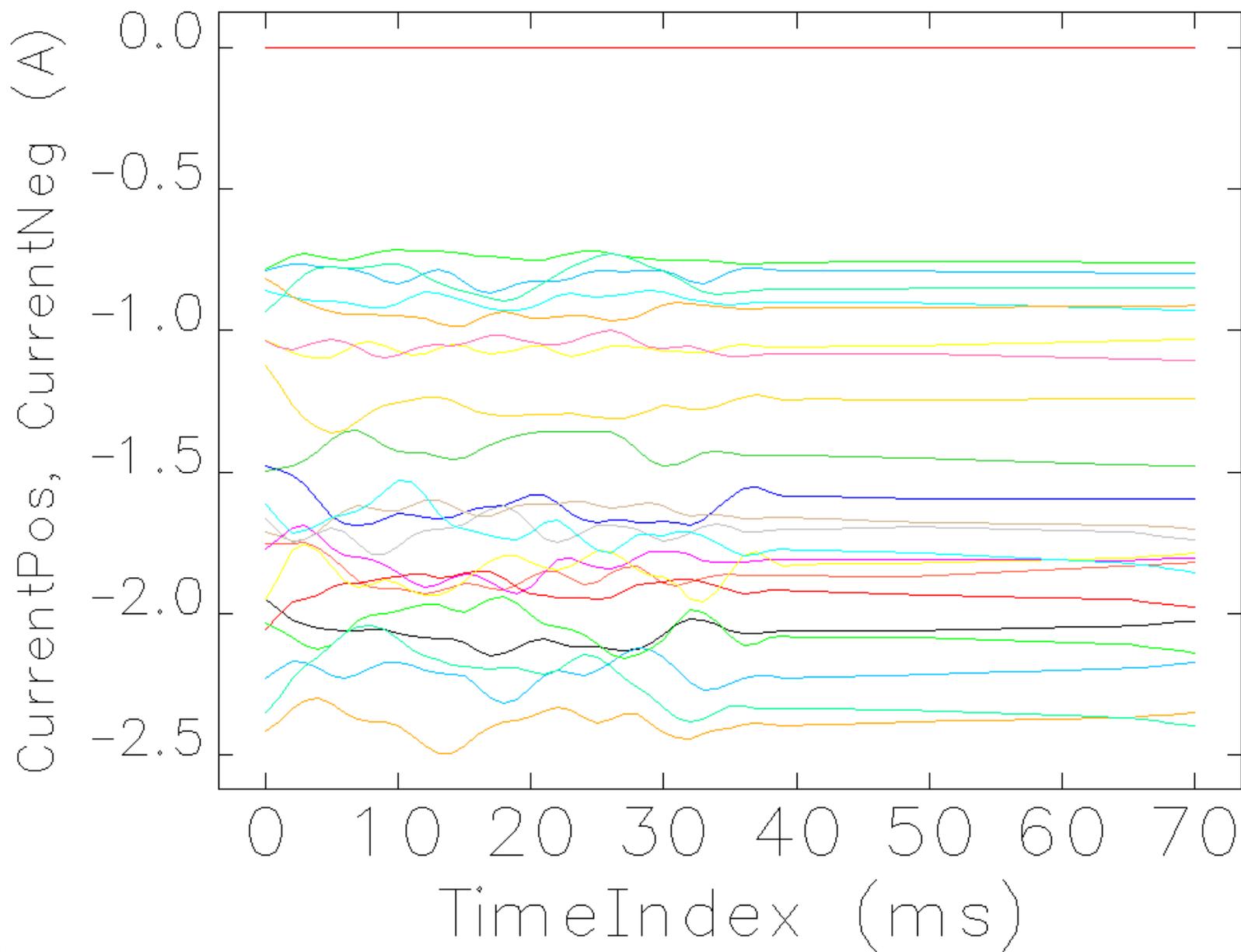




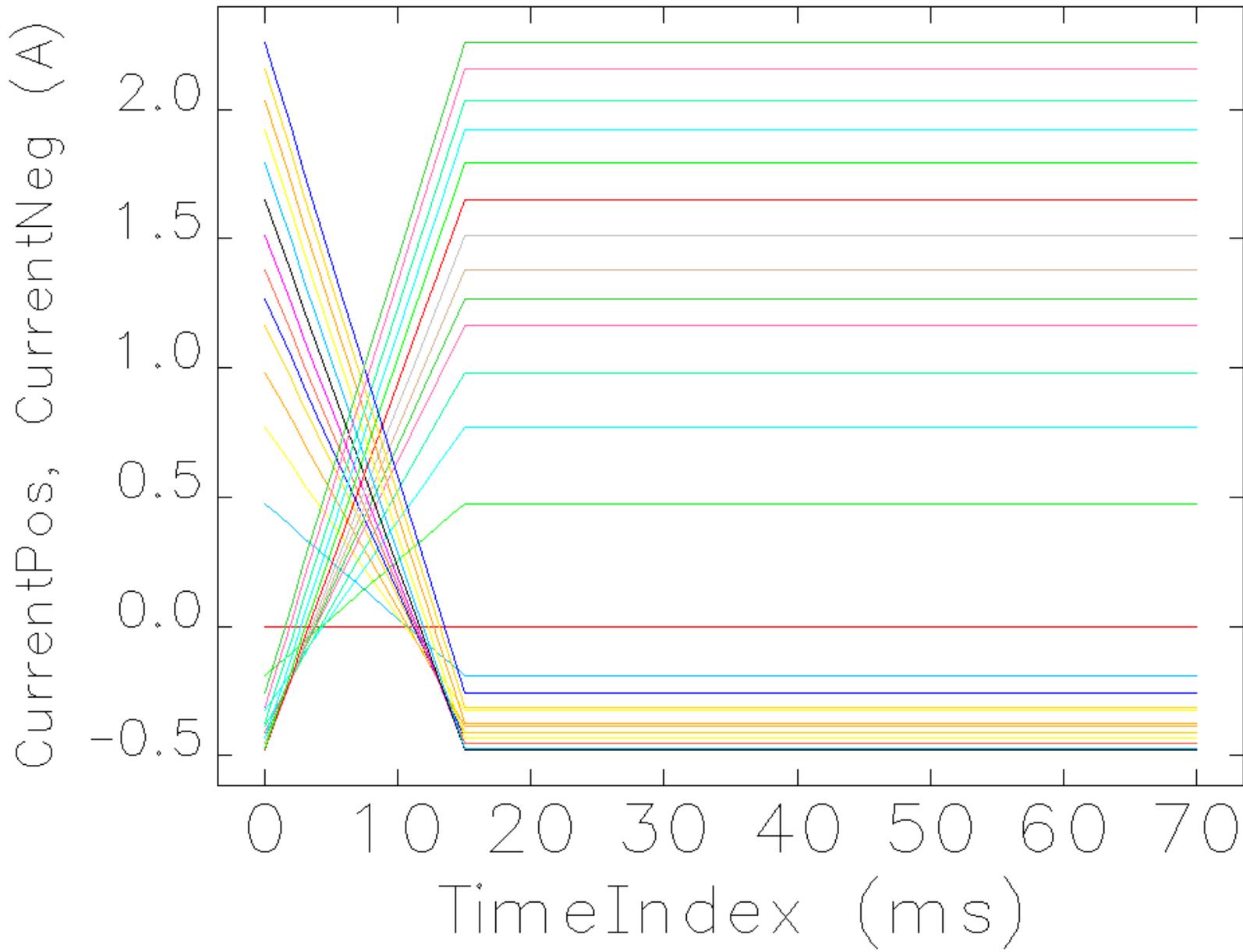
Vcorr1



Vcorr2



Quad

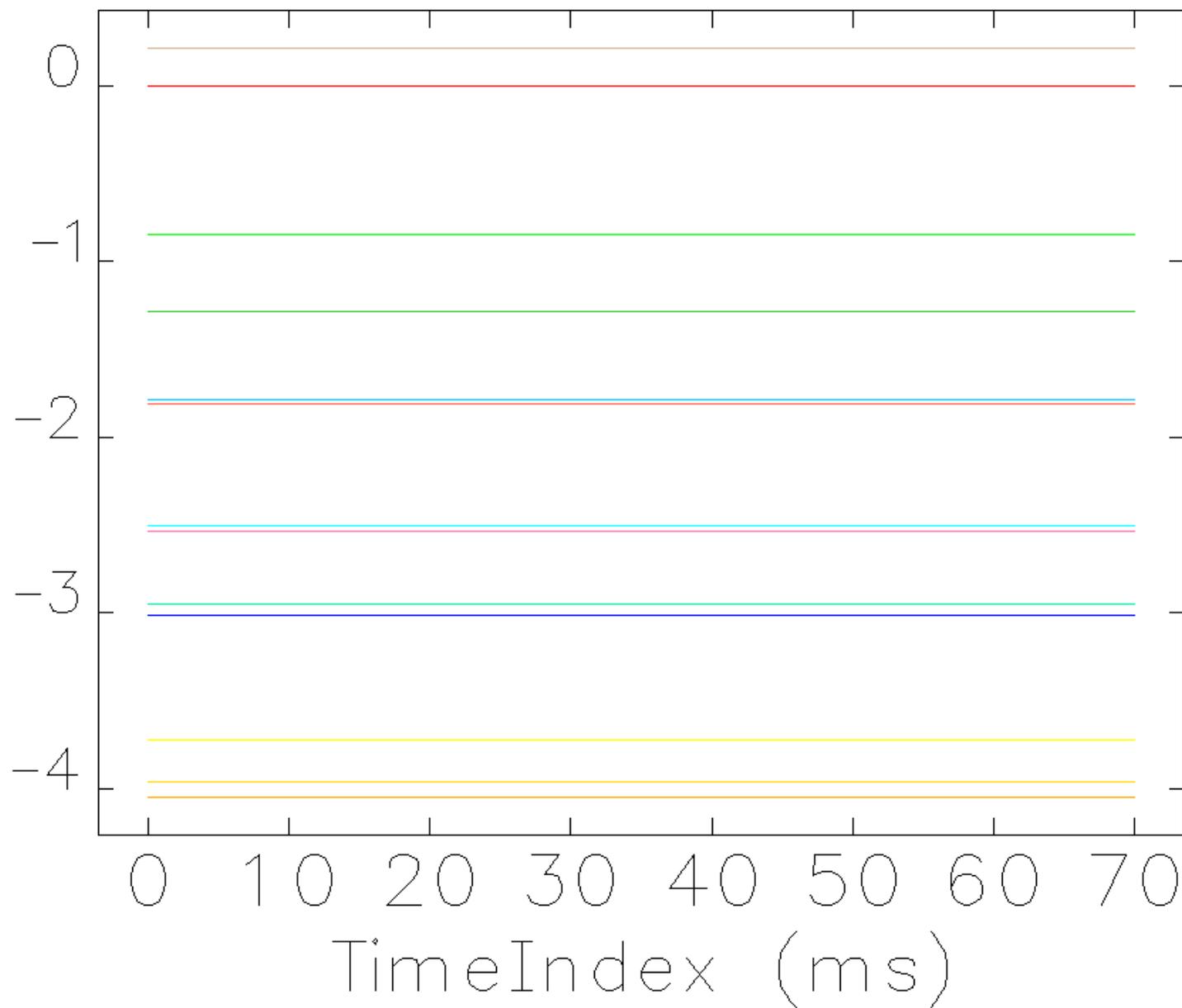


A



Skew-Q

CurrentPos, CurrentNeg



Skew-O

CurrentPos, CurrentNeg

